AUDIO VISUAL COMMUNICATION REVIEW

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Hugh M. Culbertson, Richard D. Powers — A Study of Graph Comprehension Difficulties

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RESEARCH ON NEW EDUCATIONAL MEDIA: SUMMARY AND PROBLEMS

● WILLIAM H. ALLEN

This paper was prepared for the United States Office of Education under the provisions of Title VII of the National Defense Education Act of 1958, and presents a general summary of AV communication research together with suggestions on areas needing further investigation. The author was requested to undertake this assignment as a preliminary study to be used in connection with the early planning for the administration of Title VII. His report represents an important first step. A great deal of further analysis and appraisal of new media research is needed. This will require the coordinated efforts of many individuals and institutions over an extended period of time.

Although the Office of Education agreed to the publication of this paper because of the current interest in research with new educational media, such publication does not necessarily constitute an endorsement of the views expressed by the author. William H. Allen is Advisor on Communications, System Development Corporation, Santa Monica, California.

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THIS BROAD outline digest of research in the new educational media has a threefold purpose: to summarize the major conclusions from completed research, to evaluate this research, and to outline critical areas that need further research attention.

Although the so-called "new" educational media are by no means "new" (with the exception of television and teaching machines) in terms of the length of time they have been used for educational purposes, they may be considered "new" so far as their widespread use in the schools is concerned. In general, school administrators and teachers have considered these techniques and materials of instruction merely as supplementary aids rather than integral and indispensable elements in the educational program. The new educational media, or audio-visual materials, are here defined to include motion picture films, television, filmstrips, slides, pictorial illustrations, radio, recordings, graphic materials, three-

dimensional objects, individual teaching machines, stereographs, and field trips into the community.

CONCLUSIONS FROM COMPLETED RESEARCH

Research in the use of new educational media of instruction began in 1919 and has continued to the present, characterized by financial support from agencies, philanthropic funds, and the military services. It is difficult to state exactly how many studies have been made, but they probably number between 2500 and 3000. From these studies a large body of research knowledge has been acquired, enough to permit us to make a number of valid generalizations. Gaps in this knowledge are more apparent than generalizations, however.

A tabulation of the experimental studies appearing in the literature over the past 40 years reveals that motion pictures and television have received the greatest research attention and the less expensive, more readily available instructional materials have received the least. This fact has implications for the current state of our research knowledge, which will be summarized in this section.

EFFECTIVENESS OF NEW EDUCATIONAL MEDIA

This is the area where we have the greatest amount of research evidence. It appears that any educational innovation must justify its claims. As a result, a number of studies comparing the effectiveness of teaching with new educational media and more conventional classroom methods have resulted. We call these the "comparative effectiveness" studies, and they have dominated the research since its beginnings.

In recent years, motion picture film research has changed its direction to the more rewarding study of the characteristics within instructional films, variations in their use, and their relationships to learners that can make them more effective teaching instruments. On the other hand, television research in general has not yet shown this sign of maturity, but is still characterized by studies of "comparative effectiveness"—and with monotonous regularity of result. The research on the effectiveness of the new educational media is summarized below.

Major Conclusions from the Research

Teaching Factual Information. We know, with a rather high

degree of certainty, the following points about the teaching of factual information with the new educational media:

1. Motion pictures can teach factual information content at least as effectively as conventional classroom techniques over a wide range of subject matter content, age ranges, abilities, and conditions of use. In about 85 percent of the studies comparing motion picture teaching with conventional methods, films were found to be significantly superior in these typical instructional situations.
2. The major finding from the television studies was predominantly one of "no significant difference" between teaching by television and conventional methods in typical teaching situations.
3. Information learned by these media appears to be retained at least as well as that learned by conventional teaching methods.
4. Filmstrips and slides appear to be at least as effective as motion pictures in teaching factual information, probably because they can be paced to pupils' abilities and present opportunities for student participation.
5. Inadequate research has been conducted with such other media as radio, recordings, still pictures, graphics, stereographs, models, or field trips.

Influencing Attitudes, Opinions, and Motivations. Although there is less certainty regarding the degree to which the newer media can modify attitudes, opinions, and motivations, the following generalizations appear to hold:

1. There is evidence that motion pictures, television, and radio will have an influence on attitudes, opinions, and motivations if they stimulate or reinforce existing beliefs of the audience.
2. There is no evidence that they can make changes if their messages are contrary to the existing beliefs, personality structure, or social environment of the individual in the audience.
3. It is possible that the cumulative effect of more than one communication on the same theme may be needed for any lasting change or reinforcements to take place.

Teaching Motor Skills. The newer educational media are effective teachers of perceptual-motor skills of many kinds, being ap-

parently as effective as conventional teaching methods. This is particularly true when they employ such techniques as:

1. Class participation during exposure to the communication.
2. The "mental practice" (silent rehearsal) of skills taught.
3. Use in combination with other teaching methods.

Teaching Verbal Language Skills. Although recordings, tape recorders, and television have been used extensively and effectively in the teaching of such verbal skills as foreign language, comparatively little research has been published.

Teaching Computational Skills. Use has been made of manipulative devices, models, films, and filmstrips, but the effectiveness of these media has not been measured in any comprehensive way.

Developing Concepts. There is some evidence that films can develop concepts and teach critical thinking.

Evaluation of the Research

Enough comparative effectiveness research has been conducted to show that all of the newer educational media can teach factual information. Not enough information is at hand, however, to tell us in what ways each of these media is "unique" as a teaching tool and what their comparative effectiveness would be in teaching the different kinds of learning skills if these unique qualities were emphasized. We lack a real fundamental knowledge of their effectiveness in every area but the most elementary one—that of conveying factual information. And the research with films and television has predominated. It might be a waste of research effort to continue the gross comparative studies (single medium vs. conventional instruction) with any of these media, but particularly with motion pictures and television, except under special conditions.

INSTRUCTIONAL USE OF NEW EDUCATIONAL MEDIA

Considerable research attention has been given to the techniques of using the new educational media in the classroom, the environmental conditions under which they are used, and the relationships of the learners to the use of these media.

Major Conclusions from the Research

Techniques of Using New Educational Media in the Classroom. We know, with a rather high degree of certainty, that the following

techniques of classroom use add significantly to the learning from these new media:

1. Teacher introductions and preparation of the class for the learning materials they will be exposed to.
2. The use of student participation techniques during the instructional use of audio-visual material.
3. Engagement in class discussion or review of communication material presented.
4. Exposure of students to the communication a second time.

A few studies have been made using motion picture films as "teachers" rather than only as "aids to teachers." These studies show that learning measured under such conditions is as effective as conventional instruction. Research with television instruction produced similar results.

Environmental Conditions of New Educational Media Use. In general, there has been inadequate study of the characteristics of the learning environment as it pertains to the use of the newer media. However, we do know:

1. There is no substitute for an adequately darkened room for the display of projected materials.
2. Class size probably does not significantly affect the learning of factual information from projected or television presentations under the conditions that have been measured.
3. Some principles of screen placement and size in relation to classroom seating.

Relationship of Learners to New Educational Media Use. It is safe to say that the effects of audio-visual instruction depend greatly upon the characteristics of the individuals and groups exposed to such communications. In fact, this is one of the most important single factors contributing to a communication's relative effectiveness. There is evidence that:

1. The predisposition of the learner toward the subject of the audio-visual communication influences his acceptance and interpretation of it.
2. There are no differences among the abilities of various intellectual levels to learn from audio-visual media.
3. Some form of what is called "visual literacy" (or ability to learn from visual material) develops with increased exposure to visual presentations.

Evaluation of the Research

Some real research progress has been made in identifying factors leading to more effective use of the newer media in the classroom. However, this generalization holds only for motion picture films, little research evidence accruing for other audio-visual media (including television). In general, the research on variables of classroom use of new educational media has been more rewarding than the comparative effectiveness studies, probably because they deal with problems of greater importance to the instructional process.

EDUCATION OF TEACHERS IN UTILIZATION OF NEW MEDIA

The research in the area of teacher education to utilize new educational media with maximum effectiveness is characterized by status studies and questionnaire surveys. Practically no experimental research has been conducted on ways to train teachers, either in colleges or universities or in in-service training situations.

Major Conclusions from the Research

The few evaluation-type surveys that have been made point out the following facts:

1. Teacher inertia (which may have various causes) is one of the outstanding deterrents to the use of the newer media.
2. A small percentage of teachers account for the greater percentage of materials used in the classroom.
3. Teachers who had instruction in audio-visual techniques tended to use more of the newer media in their classrooms and used them better.

Evaluation of the Research

The little we know about the education of teachers to use these media is based almost entirely on status surveys of existing practices. This does not mean that we should reject these conclusions, but that we should be aware that alternate ways of educating teachers have not been studied experimentally.

ADMINISTRATION OF NEW EDUCATIONAL MEDIA PROGRAMS

As in the area of teacher education, the research in audio-visual administration is barren of any substantial experimental studies of

administering school, city, county, state, or college audio-visual programs. There is a similar lack of research on the administration of television activities.

Major Conclusions from the Research

The few reportable status studies that have been made indicate that:

1. The most important factor in the success of an audio-visual program is the personal leadership of its program director.
2. Although the use of audio-visual media on a country-wide basis is inadequate, the situation is improving.

Evaluation of the Research

No real research has been conducted to discover desirable administrative procedures, most of the practices resulting from field experience only. There is a need for intensive investigation of different ways to operate and supervise audio-visual programs at all educational levels.

PRODUCTION OF NEW EDUCATIONAL MEDIA

Much of the instructional film research since the war has been directed toward finding the elements in the film itself which can increase its teaching effectiveness.

Major Conclusions from the Research

There is considerable research evidence available, in particular that reported by the Instructional Film Research Program at Pennsylvania State University. We know that:

1. Certain improvements can be "built-in" to audio-visual instructional communications (particularly motion picture films) to increase their teaching value. Space limitations here prevent a listing of the many variables studied and the specific generalizations that have resulted. There is a beginning, however, toward a set of guidelines that will help producers of the new educational media prepare instructional materials that will do a better job of teaching.
2. Although a start has been made to study some of the production variables unique to television presentations, there is much less research evidence available.

Evaluation of the Research

The isolation of the many elements that make for increased communication effectiveness is a tedious task, and their study is even more difficult; but much of the research that has been completed gives us useful insights into the ways instructional communications can be designed. They have a greater contribution to make to the improvement of instruction than do the more prevalent "comparative effectiveness" studies. Motion picture research has matured in this regard; television research is beginning to.

GENERAL SUMMARY OF CRITICAL AREAS NEEDING RESEARCH

This general summary of critical areas needing further research will be presented in three sections. First, some broad research considerations will be discussed. These seem to be pervasive enough to require statement separate from the large body of more specific research suggestions. Second, critical areas needing research will be grouped for each of the three objectives—the utilization and adaptation of the new media, the education of teachers to utilize such media, and the presentation of academic subject matter through such media. Third, some critical miscellaneous problems will be listed.

BROAD RESEARCH CONSIDERATIONS

The following three considerations seem crucial enough to consider in some detail, for they would tend to define the kinds of research that should be emphasized in any large-scale attempt to discover the contributions that newer educational media can make to the improvement of instruction. To be sure, they would not pertain in all cases, but are presented here mainly as possible guides to future action. It is suggested that:

1. *Research duplicating previous research be avoided.* There is ample evidence, for example, regarding the effectiveness of both television and motion picture films when compared with conventional techniques. Television particularly, in a number of large-scale studies in recent years, has devoted almost its total effort to research of this kind. It would seem wasteful to continue these "comparative effectiveness" studies except under special conditions. Similarly, the effectiveness of teaching by films has been established.

This suggestion, of course, should be taken advisedly; for some research needs replication.

2. *Research using combinations of media be encouraged.* In the past, the media have been studied in isolation, not in combination. This has been especially true of television and film research. Because of the probability that different media make different contributions to learning, we would expect more fruitful results from their use in combination. Where appropriate, it would appear desirable to bring to bear all possible combinations of media to solve instructional problems.

3. *Research that studies broad educational problems, total segments of the curriculum, and/or total educational systems is needed.* On the assumption that the use of these newer educational media will improve instruction, it seems imperative that they be applied on a scale that has the capability of bringing about major change in our educational system. This means that they might be integrated into the teaching of science, mathematics, or modern foreign language instruction across all the grades; or be applied to such problems as the teaching of the gifted child or the instruction of critical subjects in the very small high school; or discover their contributions when totally incorporated into all instructional elements of a single school, school system, or institution.

CRITICAL AREAS NEEDING RESEARCH

The following listing of suggested research studies are grouped under three objectives related to the development of new and more effective techniques and methods. They attempt to point up specific problems needing further research. They are in no sense complete, but are set forth here as suggestions only. The listing could well be increased manifold.

Utilization and Adaptation of the New Media

1. Attempts should be made to discover the unique educational characteristics of each of the media of instruction. Just what subjects and skills are they best qualified to teach and under what conditions? This should lead to a better selection of media to use for specific teaching objectives.
2. We need to know the effects of using combinations of several kinds of educational media (and this includes verbal materials as well as audio-visual) over prolonged periods of

time, with different kinds of learners, and with varying subject matter.

3. We need to know more about audience-learner characteristics and their relationships to learning from the new educational media. The nature of the learner is one of the most important single factors controlling the impact of any communication upon him.
4. What would be the effect upon learning if a classroom environment were established that provided all the equipment and learning materials needed for both group and individual study? What is the optimum amount of audio-visual equipment and materials for each classroom? For each school?
5. We need to know more about the effects on learning of other media than films and television. Filmstrips, still pictures, models, et cetera, are readily accessible to the teacher at little cost, yet we have the least research on the best ways of using them for teaching.
6. Study should be made of other "new" teaching media such as individual teaching machines, other individual teaching devices, teaching via the telephone, new kinds of visualized text materials, individual teaching by recordings, et cetera. What techniques of use should be employed to incorporate these individual procedures into standard classroom instruction and integrate them with group use of newer media?
7. We need to study many problems related to the so-called "automatization" for education. For instance:
   a. What are the consequences of large group use of films, television, and kinescopes in an auditorium or study hall over a prolonged period of time? On learning? On discipline problems? On the slow learner? On the superior student? On attitudes toward education and learning? On the teacher? On administration practices? How important is the immediate environment of the learner (his own classroom) as compared with learning in an auditorium?
   b. What would be the effects of using these media as "total" teaching instruments under certain conditions and for certain phases of instruction? What effects will this have upon the factors mentioned immediately above? Are there some teaching objectives that lend themselves more

readily to presentation in this way? Are there some kinds of subject matter content that are also more adaptable to such teaching?

c. What does this kind of automated teaching mean in terms of the values we have long attached to democratic education?

d. Does automated education, up to a point, result in better or more efficient learning? What is this point? What happens when we go beyond it?

e. What is the relationship of "better" learning to more "efficient" learning? What happens to the "quality" of education when we adopt some mass techniques of instruction?

f. How does the productivity of the teacher get increased (if at all) with the use of newer educational media?

8. We need research experience with complete instructional materials packages containing a variety of materials designed to teach, perhaps, single concepts.
9. What are the factors responsible for effective audio-visual teaching? To what extent do they depend upon the characteristics of the educational media themselves? Upon the way the materials are used in education? The characteristics of the learners with whom the material is used?
10. The motion picture film appears to have an untapped potential in modifying attitudes, opinions, and motivations because of the nature of its pictorial and emotional appeal. We need to know if this is true, and, if so, how films can be produced and used to accomplish this effect.

Education of Teachers To Utilize the New Media

1. What are the effects of educating teachers in the use of the new educational media, and how do different kinds of training programs affect the subsequent use of materials in the classroom?
2. Comparisons need to be made of the effectiveness of "separate" audio-visual courses with courses "integrated" into methods courses in the college and university training of teachers.
3. Why don't teachers in service use the audio-visual materials that are available to them?

4. What values do different kinds of supervisory techniques and programs have upon the ways teachers use the newer media in their classrooms?
5. Does the advent of television in the classroom raise any unique problems relative to the education of teachers?
6. We need to study the attitudes of teachers and school administrators toward the newer educational media. To what degree may the fear of being "replaced" by a machine affect the attitudes that teachers have, particularly as it relates to television and the use of films on a larger scale?
7. What is the effect of the training and attitudes of school administrators (particularly principals) upon the teachers' use of these media? What implications does this have for the way we educate administrators in graduate schools of education?
8. What effect does the way teachers are taught during their pre-service teacher training programs (by other than their audio-visual instructors) have upon their subsequent use of newer media in their classrooms? What implications does this have for deans of these graduate schools of education?
9. How are these negative established attitudes toward the new media changed when teachers later go into service?

Presentation of Academic Subject Matter Through Such Media

1. Full-scale studies need to be planned which team curriculum specialists in the various subject matter areas (start with science, mathematics, and modern foreign language) with specialists in the newer educational media and with textbook specialists to examine the instructional requirements of the area, setting out to implement this in every possible way with the new educational media and with verbal material.
2. What media are most appropriate to different subject matters for most effective teaching?
3. Are new kinds of equipment and devices needed to teach some of the subject matter areas?

OTHER CRITICAL PROBLEMS NEEDING RESEARCH

The miscellaneous research problems listed below do not fall within the categories specified above. This does not mean, however,

that these problems are any less crucial, for some of the most critical problems we face are discussed here.

1. What are the basic elements of learning from pictures, both still and motion? Might there be a set of unified principles for learning from visual materials of all kinds? It seems important to search for a basic understanding of the newer media as well as to study only their application to teaching.
2. How do we develop a "visual literacy" in learners? What and how should they be taught in order to learn how to "read" moving and still pictures and television most fluently and with meaning?
3. Some studies indicate there is no correlation between "interest" in a particular film or television program and ability to learn the content taught in the communication. Is this true? If it is, what are the implications for education and for the use and production of the new educational media?
4. Further study is needed of production variables, with all kinds of media, particularly as they relate to audience-learner characteristics and the techniques of classroom use.
5. It is one thing to isolate certain variables under experimental laboratory conditions, yet quite another to get them incorporated by commercial producers into the media themselves. We need study of production problems involved in incorporating these research findings, doubtless with the cooperation of the producers themselves.
6. We need developmental research on new kinds of equipment such as simple, magazine-load motion picture projectors; low-cost, sound-film projectors; application of video-tape to school use; teaching machines; et cetera.
7. We need to study the characteristics of the "television teacher." Some recent studies indicate that experience and personality may not necessarily be requisites for effective teaching over television. This problem needs further study.
8. Certain advantages and disadvantages have been assumed for each of the new educational media. We need to submit these assumptions to experimental study.

9. It would appear desirable to take many of the isolated but related findings from studies already made and apply them in one or more operational situations. These may be utilization programs, teacher education programs, subject matter, content-centered administrative organizations, or the production of new educational media. Because of the many variables in such a study, it might be difficult to make a true experimental comparison. Such studies may be termed "evaluative."
10. Can the conclusions from motion picture research be transferred to teaching by television? The application of this large body of film research to television would result in considerable saving in research time. If such a transfer can be made, under what conditions is it valid?
11. Some study should be made of the applications of new research instruments, such as the electronic computer, to the solution of problems related to the utilization, production, and administration of new educational media.
12. Audio-visual administrative studies are needed on audio-visual library structure, centralization vs. decentralization, standards for equipment and physical facilities, procedures for evaluating and selecting instructional materials, cateloging procedures, budgeting procedures, distribution procedures.

A STUDY OF GRAPH COMPREHENSION DIFFICULTIES

● HUGH M. CULBERTSON
● RICHARD D. POWERS

This study was made to determine how much certain factors of graph design contribute to ease of graph comprehension, and was undertaken as an M.S. degree project by Mr. Culbertson. The authors are on the faculty of the Agricultural Journalism Department of the University of Wisconsin.

POTENTIAL graph users must often choose from a variety of ways to present data graphically for nontechnical readers. They almost always choose on the basis of tradition or advice given in books, as there is very little research evidence to go on.

This paper reports an effort to investigate how much certain graph variables contribute to graph difficulty. The question discussed is "What characteristics of graphs make for ease or difficulty of comprehension?" and not how graphs compare with other means of presenting numerical data. The study was part of a larger investigation conducted in cooperation with the Office of Information, U. S. Department of Agriculture,* which uses many graphs in communicating numerical information in publications.

METHOD

Twenty-five graphs were designed, all based on the same model graph, but changed in various ways to disguise the similarity and to manipulate the graph variables being investigated. Each graph

* Larry Sarbaugh, U. S. Department of Agriculture, greatly helped this project by checking the standardization of test materials. Thanks are also due Professor George Sledge of the University of Wisconsin, Department of Agricultural and Extension Education, for arranging testing schedules with vocational agriculture teachers Arthur Kautza, Daniel Shied, William Boyle, and Fenton Abrams; and to Professor J. F. Wilkinson and members of his 1957-58 Farm Short Course at the University.

contained four units, and each unit was split into three elements.

An *element* is defined as the smallest part of a graph—a segment of a bar, one of a group of bars, a segment of a circle, or a line on a grouped line graph.

A *unit* is a group of three graph elements—three segments of a segmented bar, a group of three grouped bars, one circle, the top line of a surface chart, or the total of three lines at any point on a grouped line graph. (For several examples, see the models on pages 101 through 103 of this article.)

Each graph was presented with a series of four to seven multiple-choice questions. The questions asked for a standard set of "interpretive operations"—i.e., evaluations of or comparisons between elements of the graph. Graph elements compared and judged were of the same size and in about the same location for all graphs presented.

These interpretive operations, cast in the terms of each graph, asked the respondent to:

1. Estimate relative length of four units.
2. Estimate the quantity of an element originating at the zero line of the graph.
3. Estimate the quantity of an element originating at some point other than zero on segmented graphs.
4. Judge the relative length of two different elements within the same unit.
5. Judge the relative length of two differently labelled or keyed elements in different units.
6. Judge the relative length of two similarly labelled or keyed elements in different units.
7. Judge the difference between two differently labelled or keyed elements in different units.

About 100 students in the University of Wisconsin Farm Short Course were given the test of 25 graphs. They completed the test easily in two 50-minute periods, scoring an average of 80 percent correct answers. Practically all the students had recently completed high school, were between 18 and 24 years of age, and were engaged in farming as an occupation.

Conclusions drawn from tests of the Short Course students were verified by testing about 250 students in Wisconsin high schools.

The graphs contained fictitious data on agricultural production, demography, and other areas related to agriculture. The data were kept as plausible as possible, but students were warned to answer from the graphs and not from prior knowledge. True

data were not used because of the need to keep comparisons standard for all graphs in the study.

The 25 graphs allowed two or more controlled comparisons on each of 11 graph variables:

A. Identification of elements (see Figure I for numbers 1 and 2):
   1. By labels
   2. By keys
   3. By pictorial symbols

B. Presentation of quantities (see Figure I):
   1. By figures-on-elements
   2. By means of a grid on graph axis

C. Bars or line graphs (see Figure II):
   1. Discrete bars
   2. Continuous lines

D. Two types of comparison within a graph unit (see Figure II):
   1. "Segmented" arrangement for presenting constituent parts of a total. Some elements of this graph do not originate from the zero base line.
   2. "Grouped" arrangement for presenting constituent parts of a total. All elements of this graph originate at the zero base line.

E. Two ways of presenting parts of a whole:
   1. Pie charts for presenting percentages
   2. Segmented bars for presenting percentages

Each comparison involved two graphs that differed only in one variable. Thus it was possible to compare graphs with keys and graphs with labels as to ease of comprehension while the other variables (grid or figures-on-elements, line or bar form, et cetera) remained constant. The comparisons were made by t-tests of differences between mean scores of each group.

The Farm Short Course students also took the Differential Aptitude Tests (Psychological Corporation, New York) for verbal reasoning ability, abstract reasoning ability, and numerical ability. These were correlated with scores for general graph comprehension ability (percentage of correct answers to questions on all 25 graphs) and with the number of correct answers for each graph. IQ percentile scores for 140 of the high school students were also correlated with general graph comprehension scores.

RESULTS

Bar Graphs or Line Graphs?

Six pairs of graphs were designed to compare line graphs and bar graphs. Both horizontal and vertical bar graphs surpassed line graphs under the conditions of this study.

The four sets of subjects (one group of 94 Short Course students and three groups of 70 to 90 high school students each) provided 24 comparisons between lines and bars. All gave a higher mean score on the bar graph—22 by amounts which were significant at 95 percent confidence. See Table 1.

TABLE 1.—NUMBER OF COMPARISONS FAVORING LINE, BAR GRAPHS

	Short Course (N = 94)		*1st High School* (N = 67)		*2nd High School* (N = 89)		*3rd High School* (N = 92)	
	Favor Line	*Favor Bar*	*Favor Line*	*Favor Bar*	*Favor Line*	*Favor Bar*	*Favor Line*	*Favor Bar*
Total	0	6	0	6	0	6	0	6
99% Significant	0	1	0	4	0	5	0	3
95% Significant	0	5	0	2	0	0	0	2

Figures Given or Grid Lines Used?

In seven cases, one graph had values written on each element while an otherwise similar graph had grid lines from which readers judged quantities. For all four groups of subjects, five of the seven graph pairs gave consistently higher mean scores with figures-on-elements than with grids.

Separate analysis of the four groups of subjects yielded 28 comparisons between grids and figures-on-elements. A total of 20 gave higher scores for graphs with figures-on-elements—11 significantly at the 95 percent level of confidence. Seven differences favored grids, but only three of these were significant. In one comparison, there was no difference between the graph with figures and the graph with a grid. See Table 2.

Labels or Keys?

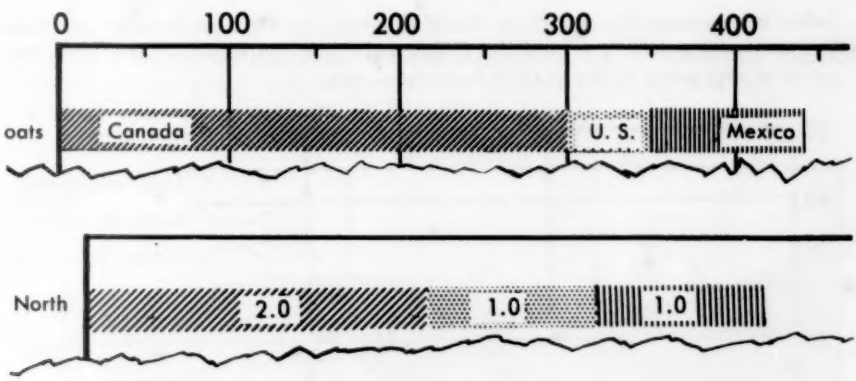
Results on seven of eight graph pairs indicated that labels are generally easier to read than keys. Labelled graphs had identifying words on each element. Keyed graphs identified elements through a cross-hatched key to the right of or below the graph.

TABLE 2.—NUMBER OF COMPARISONS FAVORING GRIDS, FIGURES-ON-ELEMENTS

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Grid	*Figures-on-Elements*	*Grid*	*Figures-on-Elements*	*Grid*	*Figures-on-Elements*	*Grid*	*Figures-on-Elements*
Total	2	5	2	5	2	5	1	5
99% Signif.	1	2	0	0	0	0	1	0
95% Signif.	0	1	0	2	1	3	0	3

Twenty-two comparisons gave higher mean scores for labelled graphs—seven significantly at the 95 percent level of confidence and one at the 99 percent level. See Table 3. Eight comparisons favored keys—including two that were significant.

Only one pair of graphs gave consistently higher mean scores for the keyed graph than for the labelled graph. These two graphs had figures-on-elements and were grouped. It seems likely that keys might work fairly well with such graphs, as the key is the only necessary reference point outside of any element.

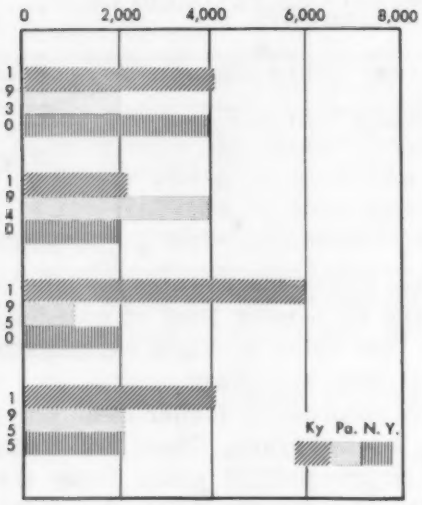


Top: Bar elements identified with a label, but reference to the grid at the top is needed for determination of quantities represented.

Bottom: Bar elements must be identified by reference to the key below but quantities are noted by figures on the element. In these graphs the entire bar is the graph *unit*, while the differently shaded segments are graph *elements*.

Figure I

Graph Variables and Their Presentation Compared



At left is a grouped bar graph. This graph shows horizontal format.

Below is a grouped line graph in which elements are the area between the base line and each graph line, and the graph units are the totals of the three elements at any point on the graph's horizontal axis.

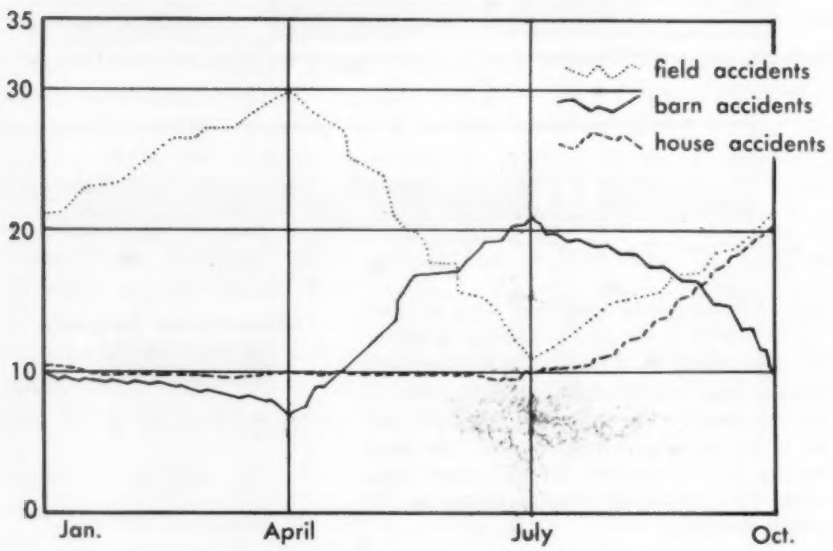
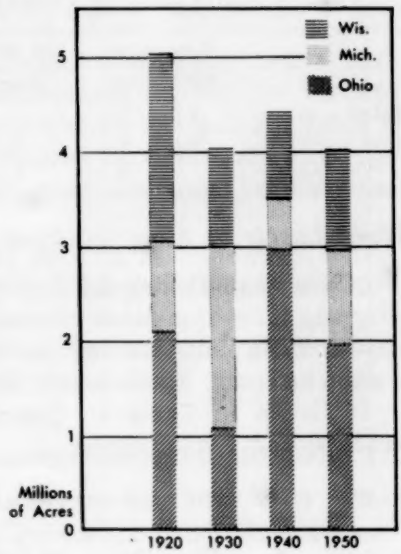


Figure II

Factors of Bar and Line Graphs Compared

At right is a segmented bar graph. This graph shows vertical format in contrast to the horizontal format on the opposite page.



Below is a segmented line graph (surface chart) in which differently shaded portions are the graph elements, while the distance from the base line to the top graph line is the graph unit.

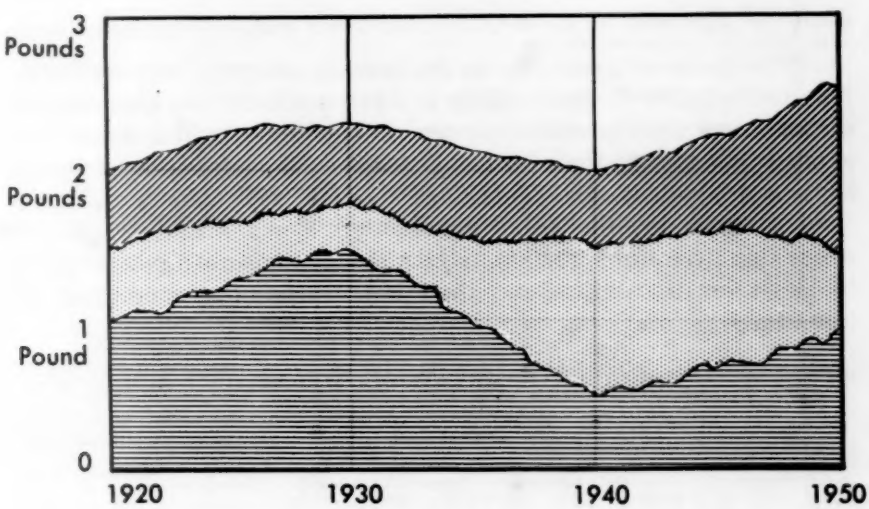


Figure II (Continued)

Factors of Bar and Line Graphs Compared

TABLE 3.—NUMBER OF COMPARISONS FAVORING LABEL, KEY

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Label	*Key*	*Label*	*Key*	*Label*	*Key*	*Label*	*Key*
Total	7	1	5	2	5	2	5	3
99% Signif.	0	0	0	0	0	0	1	0
95% Signif.	1	0	1	1	3	0	2	1

Word Labels or Pictorial Symbols?

Two graph pairs differed only in that one graph identified elements through a label on each element while the second graph identified elements through outline symbols (i.e., a drawing of a tractor or cow). Symbols and labels gave near equal mean scores, as is shown in Table 4. Comparisons involved both horizontal bar-type and circle graphs.

TABLE 4.—NUMBER OF COMPARISONS FAVORING SYMBOL, LABEL

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Symbol	*Label*	*Symbol*	*Label*	*Symbol*	*Label*	*Symbol*	*Label*
Total	0	0	1	1	0	0	0	0
99% Signif.	0	0	0	0	0	0	0	0
95% Signif.	0	0	0	0	0	0	0	0

Pictorial Symbols or a "Key"?

Two pairs of graphs were designed to compare pictorial symbols and keys. Both pairs solidly favored symbols over keys. Eight comparisons were provided, seven giving higher mean scores for symbol-type graphs than for keyed graphs. No comparisons favored keys over symbols. See Table 5.

In summary, the data suggest that symbols and labels are about equally suitable for identifying graph elements. Both seemed to be easier to comprehend than keys under the conditions of this study.

TABLE 5.—NUMBER OF COMPARISONS FAVORING SYMBOL, KEY

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Symbol	*Key*	*Symbol*	*Key*	*Symbol*	*Key*	*Symbol*	*Key*
Total	2	0	1	0	2	0	2	0
99% Signif.	0	0	0	0	1	0	0	0
95% Signif.	2	0	1	0	0	0	1	0

Horizontal or Vertical Bars?

Four pairs of graphs were designed to compare horizontal bars with vertical bars. Eight t-test comparisons favored the vertical format—three significantly at 95 percent confidence. As Table 6 shows, five comparisons favored horizontal bars—two significantly. Three comparisons showed no difference between vertical and horizontal format.

The data suggest that vertical bars may be slightly better than horizontal bars with some types of graphs. But the evidence is not conclusive. Horizontal bars give more room for figures and labels on or near elements—a practical factor which graph users must consider because tests strongly favor these two variables.

TABLE 6.—NUMBER OF COMPARISONS FAVORING HORIZONTAL, VERTICAL

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Horizontal	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*
Total	1	2	2	1	1	2	1	3
99% Signif.	1	1	0	0	0	0	1	0
95% Signif.	0	0	0	1	0	1	0	0

Segmented or Grouped Graphs?

"Grouped" graphs generally gave higher mean scores than "segmented" graphs. Grouped line graphs were clearly better than segmented surface charts (all seven significant differences favored grouped line charts). The grouped format also appeared to be best when bar graphs were tested (by 8 significant differences to 1), though two of the five bar graph pairs used showed no consistent difference between the grouped and segmented formats. See Tables 7 and 8.

TABLE 7.—NUMBER OF COMPARISONS FAVORING SEGMENTED, GROUPED (BAR GRAPHS)

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Segmented	*Grouped*	*Segmented*	*Grouped*	*Segmented*	*Grouped*	*Segmented*	*Grouped*
Total	2	3	0	4	2	3	1	4
99% Sig.	1	1	0	2	0	1	0	2
95% Sig.	0	0	0	0	0	1	0	1

TABLE 8.—NUMBER OF COMPARISONS FAVORING SEGMENTED, GROUPED (LINE GRAPHS)

	Short Course		*1st High School*		*2nd High School*		*3rd High School*	
	Segmented	*Grouped*	*Segmented*	*Grouped*	*Segmented*	*Grouped*	*Segmented*	*Grouped*
Total	0	2	0	2	0	2	0	1
99% Sig.	0	2	0	0	0	0	0	1
95% Sig.	0	0	0	1	0	2	0	0

Analysis of two graph pairs showed no near significant difference between multi-circle graphs and segmented bars for percentage data.

Correlating Intelligence and Differential Aptitude Scores with Graph Reading Scores

Pearsonian correlation showed that differential aptitude scores on verbal reasoning, numerical reasoning, and abstract reasoning each correlated moderately with graph comprehension ability as measured by the total number of correct answers to the entire graph test. Examine Table 9.

TABLE 9.—RELATIONSHIP OF THREE DIFFERENTIAL APTITUDES TO GRAPH READING ABILITY

Ability	*Mean*	r*	*σ (ability)*	*No. of Subjects*
Numerical Reasoning	51.0	.551	18.8	92
Abstract Reasoning	54.5	.554	21.5	99
Verbal Reasoning	51.1	.557	17.1	107
Hemnon-Nelson IQ (Wisconsin percentile rank)	42.0	.427	27.3	141
Graph Comprehension	80.2	—	—	250

* Each r value relates the stated aptitude or IQ test score to the total graph comprehension score. An r value of .25 and above is highly significantly above zero.

This study and other correlation analyses involving Differential Aptitude Tests show that:

1. Each of the three aptitudes tested is highly significantly related to graph reading ability.
2. All three aptitudes relate more closely to word reading than to graph reading (8).

3. The test score for any of the three aptitudes is related to the general graph comprehension score in about the same degree as it is related to each of the other aptitude test scores.

Correlation analysis was used to measure the relationship between scores on individual graphs and scores on three Differential Aptitude Tests. No single variable (i.e., lines versus bars or keys versus labels) consistently influenced the correlation between graph reading ability and aptitude test scores.

However, graphs with three or four "difficult" traits (segmented, key, line, or grid) often correlated significantly more closely with each aptitude than did a graph that had several "easy" traits. This could mean that certain graph traits have a cumulative influence on graph difficulty.

DISCUSSION

Graph Variables

1. Bar graphs proved convincingly easier to read than line graphs, partly perhaps because bar graphs clearly connect the horizontal axis with each abscissa value to be read. Line graphs do not clearly pinpoint abscissa values; so picking out points on a line might make comprehension difficult.

2. Surface charts (segmented line graphs) proved very difficult. Surface charts are used widely—possibly because they are attractive and easily constructed.

This study required noting and comparing specific quantities. It did not present trend or progress data—the traditional function of line graphs. Even for this function, however, the authors feel that trend-type bar graphs would be more easily understood than line graphs. Such graphs would simply show the year of upturn, the year of downturn, and selected years in between.

3. The study suggests that each graph element should be identified by a label on or near the element. A cross-hatched key for element identification may add to a graph's difficulty because it requires associating word meanings through visual patterns.

4. Graphs with identifying symbols appeared to be about as easy to read as those with labels. Both the symbol and label proved better than use of a key. The current study used symbols to identify elements and not as counting devices (e.g., one drawing of a cow refers to 10,000 head). Counting symbols present a new set of interpretive problems.

Future studies might investigate the supposed concreteness of symbols. We need to know whether a symbol helps understanding because it *looks like* its referent (while words supposedly are more abstract), or whether use of a pictorial symbol simply heightens interest, or whether it serves some other purpose.

5. Graphs with figures placed on each element appeared generally more informative than those in which the reader estimates quantity by referring to a grid. Grid lines force the reader to: (a) locate the beginning and end of an element, (b) follow the nearest grid line to the quantitative axis, and (c) read the corresponding value on the quantitative axis. Obviously this three-step process is more complicated than reading a figure right on each element, and the difference in difficulty is reflected in test scores.

6. Comparison of segmented and grouped graphs favored the grouped format. Results were more conclusive when line graphs were tested than when bar graphs were tested. The reader's interpretive operation seems especially important in choosing between the grouped and segmented format. This study has emphasized evaluation of elements more than evaluation of units, as presentation of specific elements is the only reason for using a complex graph (with more than one element per unit). Suitability of each graph variable for each interpretive operation was not explored in this project.

7. Circle graphs or segmented 100-percent bar graphs were about equally well suited for showing percentage data in this study. Other comparisons of circles and segmented bars have given rather contradictory results (2, 3, 4, 6).

8. Vertical bars appeared slightly better than horizontal bars with some types of graphs (5). But evidence was not conclusive. The horizontal format is advantageous because it allows placing of labels and figures on or near elements.

Relating Mental Capacity to Graph Reading Ability

This study indicates that Differential Aptitude Tests and IQ scores both correlate moderately with graph comprehension ability. Apparently neither measure can serve to predict differences in graph scores or even go very far toward explaining such differences. Strickland (7) reached a similar conclusion regarding IQ in a study of elementary school children.

Investigation of perception and basic mental operations may be basic to further studies relating intelligence to graph reading.

These operations include associating word meaning with visual patterns, judging distances between lines (1), and judging relative lengths or widths (5).

SUMMARY

This study sought to determine how much certain factors of graph design contribute to ease of graph comprehension. Tests were given to about 100 vocational Farm Short Course students at the University of Wisconsin and to about 250 high school students in Wisconsin. Nine different choices in graph design were investigated. Differential Aptitude Test scores by the Short Course subjects were correlated with general graph comprehension scores and with scores on each group. Intelligence test scores were substituted for D.A.T. scores in the high school analysis.

- Both horizontal and vertical bar graphs proved better than line graphs for evaluating and comparing specific quantities.
- Quantities written on each element gave higher test scores than did grid lines. Reading grids apparently involves mentally connecting an abscissa or ordinate value to the corresponding point on the quantitative axis. Future study may show that grids work well for certain interpretive operations.
- Labels on each element gave higher mean scores than did cross-hatched keys for element identification.
- Symbols for identifying graph elements were easier to read than keys and about equally as good as labels.
- Grouped line graphs (with each element originating from the zero base line) appeared to be somewhat easier to read than segmented line graphs (surface charts). However, firm conclusions on segmented and grouped graphs will require study of mental interpretive operations.
- Circle graphs (pie charts with four circles) and segmented bar graphs worked about equally well for percentage data.
- Vertical bars appeared to be slightly easier to read than horizontal bars with certain types of graphs. However, horizontal bars had the edge in one type of graph tested. Horizontal bars often work best because they provide room for labels and figures on or near elements.
- Differential Aptitude Test scores in numerical, verbal, and abstract reasoning correlated moderately with graph reading.

Intelligence test scores also correlated moderately with graph reading ability, though the correlation was somewhat lower than the D.A.T. scores. No one variable of graph design caused consistent differences in degree of correlation between graph comprehension ability and aptitude or intelligence.

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Recently Discovered Manuscript

SOME NOTES FOR AN ESSAY ON GRISWOLD AND READING

Peabody Nightingale, late Professor of Education
Thomas Edison Teacher Training Institute
Bull Moose, Montana

William H. Allen, Editor
Audio-Visual Communication Review

Dear Bill:

As you know, there has been some discussion in audio-visual circles over the last few years concerning the anti-audio-visual bias of certain members of the "literary set." I refer here to writers like Joseph Wood Krutch, an associate editor of the SATURDAY REVIEW *and one of the most famous of American critics. This dislike of audio-visual communication devices and materials is not new with Krutch (Paul Reed did an editorial on his attitude years ago in the* EDUCATIONAL SCREEN*), and is by no means his exclusive domain, as his dislike of the audio-visual is apparently shared by a group of classicists, writers, and critics.*

The newest development in this direction is that, in addition to the usual sniping remarks that appear from time to time in various literary publications (publications that may, in the same issue, carry other departments reviewing films and records), the literary anti-audio-visual attitude has been picked up by some of the professional critics of education that are making so much hay these days.

Thus, we find that Mortimer Smith, spokesman for the Bestor-inspired Council for Basic Education and the most vicious educational critic writing today, is now waving the anti-audio-visual flag. Smith's influence cannot be ignored because, in addition to his monthly diatribe in the CBE BULLETIN *which reaches many important opinion-formers in the United States, he also has access to the columns of quality magazines like the* ATLANTIC*—magazines which, for the most part, are closed to us.*

As an example of the position of Smith and the CBE, the June, 1958 issue of the BULLETIN *is instructive. With approval, Smith quotes Joseph Wood Krutch as follows:*

Give people a picture if they can't read and you merely encourage them not to be able to read. If I were the dictator of the educational system . . . , I would abolish almost the entire system of visual education. I think it is not true that a picture is better than a thousand words. I think in many areas, a thousand words is [*sic*] better than 10,000 pictures.

Now what does all this have to do with Peabody Nightingale? As you know, I am a native of Montana and got to know the old gentleman during his last few years at Bull Moose. For some reason, he was taken with me and, after his recent death, I was pleasantly surprised to find that he had left me his important papers. They are voluminous, and I have had time to do little but riffle through them. However, the enclosed, almost completed essay caught my eye and I took time out to read it. The manuscript bore the title as I have listed it, "Some Notes for an Essay on Griswold and Reading." Professor Nightingale deals, in these notes, with this problem of the literary anti-audio-visual bias, and I thought they ought to be presented to the profession as soon as possible. I have full permission from Professor Nightingale's heirs for the reprinting of these notes and, hence, am submitting them to you.

The reference to Griswold is, of course, to his widely publicized speech at the National Book Awards dinner of 1952 in which he restated the literary vs. the audio-visual position. However, as will be seen from the notes, Professor Nightingale did not stop there, but had in mind dealing with the topic in general. I think we can find in his reasoning some important answers to this recrudescence of anti-audio-visual criticism which, paradoxically, is rising during a great expansion of the audio-visual movement.

The manuscript is substantially as I found it. I have added explanatory footnotes here and there where I thought they would help. I hope you can find room to print it.

Cordially,

James D. Finn, Professor of Education
University of Southern California

I WAS RIGHT in thinking President Griswold's speech on the occasion of the National Book Awards was important when I caught that phrase, "We have traded in the mind's eye for the eye's mind," in the *Saturday Review*. I'm very glad *Harper's* decided to print it in full.[1] But that "eye's mind" phrase still bothers me. Griswold's essay could stand some examination.

The personal essay is supposed to be out of fashion. Yet Griswold was personal enough. He even brought his bedroom into the speech. And I have always liked the personal essay. If I

[1] The speech may now be found in Griswold, A. Whitney. *Essays on Education*. New Haven: Yale University Press, 1954. p. 65-72. Griswold, of course, is the President of Yale.

decided to use it, how would I begin to examine his propositions? Somewhere I have read that many personal essays begin, "Some of my best friends have been . . ." (in this case, "college presidents"). That's partly true. One of my best friends is a college president *emeritus;* I have known several fairly well, and I know of two others that keep such Olympian distances between themselves and their faculties that they could sleep on a bed of nails and the professors would never know it, let alone the contents of the night stand alongside the spikes.

Griswold certainly doesn't belong in this last category. Judged by his essay, he is very human, intelligent, and urbane. And he is obviously a man of conviction that would not be swayed too easily by the wind blowing from the nearest alumnus or Women's Breakfast Club. Much of what he has to say is sound and thought-provoking, and I would certainly like to add his name to my small list of "some of my best friends." But there are still one or two things in what he says. . . .

The essence of President Griswold's argument is this: (1) The people of the United States are suffering from an all-consuming disease which he calls technological illiteracy. By this he means that the average citizen no longer reads widely in informative, challenging, or beautiful literature. (2) The Founding Fathers of our country were great thinkers, statesmen, and creators because they did read widely everything that was in print in the Western world, proving the usefulness of such a pursuit. Furthermore, these same Founding Fathers forged the materials they read into new literature by writing vigorously and prolifically all of their lives, thus developing discipline in thinking. (3) Today we have technological illiteracy created by television, ghost writers, opinion-samplers, et cetera. "We have traded in the mind's eye for the eye's mind." The implication is that we have substituted the picture for the word. "[Reading] . . . hangs on in competition with more efficient methods and processes, such as the extra-sensory and the audio-visual." (4) The great amount of leisure time now available to all men, if used for picture-watching instead of for reading and reflection, will create a nation of empty men, of muscle and mob-men.

President Griswold's thesis is alarming. But, as a political scientist, I suppose he would be the first to ask whether or not such alarms have been sounded before. Is this another case of the boy, the sheep, and the wolf? At least, we can establish quickly that

other people have been worried about the same problem over the last hundred and fifty years. Clifton Fadiman, in a very penetrating essay in the *Saturday Review* called "The Decline of Attention," [2] developed this idea completely. He covered more ground and, as my friend Professor Edgar Dale says, "uncovered more ground" on the same subject than did Dr. Griswold.

Fadiman noted that Henry James was worried about this problem in 1902 when he said, among other things, that "the faculty of attention has utterly vanished from the . . . anglo-saxon mind, extinguished . . . by the newspaper and the picture (above all) magazine [*sic*]." And he went on to use words like "illustrations, loud simplifications, and *grossissements*." Fadiman also cited Wordsworth a hundred years earlier in 1802 to the effect that ". . . a multitude of causes . . . are now acting with a combined force to blunt the discriminating powers of the mind . . . and to reduce it to a stage of almost savage torpor." Wordsworth blamed ". . . a craving for extraordinary incident which the *rapid communication of intelligence* hourly gratifies." (Italics mine)

However, Fadiman, for all his literacy, missed when he didn't quote Wordsworth's poem, "Illustrated Books and Newspapers" written in 1846.

> DISCOURSE was deemed Man's noblest attribute,
> And written words the glory of his hand;
> Then followed Printing with enlarged command
> For thought—dominion vast and absolute
> For spreading truth, and making love expand.
> Now prose and verse sunk into disrepute
> Must lacquey a dumb Art that best can suit
> The taste of this once-intellectual Land.
> A backward movement surely have we here,
> From manhood—back to childhood; for the age—
> Back towards caverned life's first rude career.
> Avaunt this vile abuse of pictured page!
> Must eyes be all in all, the tongue and ear
> Nothing? Heaven keep us from a lower stage!

It would certainly seem that Griswold and Fadiman have not laid hold of anything new. It would take a finer literary sense than mine to judge whether Griswold's "mind's eye" phrase was better or worse than Wordsworth's "Must eyes be all in all" written one hundred six years before. Apparently, literary men in general do not like the "rapid communication of intelligence,"

[2] Now to be found in *The Saturday Review Reader*. New York: Bantam Books, 1951. p. 23-36.

especially if pictorial means are used. "In the beginning was the Word." Apparently at the end, there must the Word be also. It does seem a little bit like the boy, the sheep, and the wolf.

However, I suppose the pragmatic question would still be, is it really the wolf after all these years? Are we now so illiterate? Have we reached the point described by Fadiman where

> the goal of the word is to approach the condition of the picture . . . [the picture] which attracts at once; it induces an immediate stimulus, and it is forgotten directly. It is the ideal medium of communication without real connection, so ideal as to make it inevitable that the two great communications inventions of our time—the radio and the movie—should somehow copulate and engender television.

Why do literary men object to the rapid communication of intelligence? President Griswold even brings in the extrasensory as objectionable, and I was not aware that Dr. Rhine and his associates had so far been able to achieve a degree of communication that would compete with books. There is a deep-seated fear at work here. Could it be that these literary men are mental flagellants? Are they searching for means to make the mind suffer for what it gets? Do they hold that "prose and poetry of meaning and substance" constitute a series of mental weights to be lifted until one's brain is muscular enough to show well in a competition for Mr. Cloister of 1952?

One of the first difficulties with this position is that from the point of view of the *literati* only "reasonably complex works of literature and speculation" (Fadiman's phrase) are useful for mental weight-lifting. As I understand this phrase, the social sciences, the natural sciences, and technology would have to be classed as mental featherweights (except as in their upper regions the sciences cross over into philosophy, thus permitting the literary gentlemen to comment wisely on Einstein, and so on).[3] Disregarding the fact that the theory of mental discipline has long since been exploded in psychology, our scribbling friends would be hard put to establish a scale of hardness—and that's what they are talking about in part—which would place factor analysis, footlamberts, the measurement of social class, and circuit feedbacks down with McGuffey's Readers; and Publius, Shaw, Plutarch, and the "new criticism" in the graduate school.

But our typewriter-pounders do not really mean to establish a scale of hardness. That is ridiculous. What they mean to set up

[3] The post-sputnik science binge outdates this concept to the extent that the scientists and engineers have now been accepted by the literary set. The degree of acceptance is still, however, very questionable, public statements to the contrary.

is a sort of pecking order in which reasonably complex works of literature and speculation are *better* than works in the sciences, technology, and social sciences. And they defend this order by implying that reading the former requires more "mental stretch" and by maintaining that it is the only way to the "human" viewpoint. All other ways, they imply, lead to Orwell, *1984*, and technological illiteracy. So I conclude that the rapid communication of intelligence is objectionable to the *literati* because it makes things easier than they have any right to be, and that, in making things easy, the pecking order of literature on top and everything else below is somehow threatened.

President Griswold implies that the cause of technological ililteracy is the technology of communication; Mr. Fadiman, probing deeper, absolves advertising, education, and picture magazines of the blame and finds the cause in the industrialization and urbanization of society which has changed values and our way of life. In a sense, both men are wrong. If I may use a comparison which will probably strike horror in the minds of these literary gentlemen, they are both somewhat like a photographer setting up his lights to take a picture of a cube. The location of his light or lights will determine exactly what the cube will look like in the finished picture. Both these essays are brilliant and illuminating, but they only highlight one side of the cube and give a flat picture. Solid geometry, on the other hand, informs me that a cube has six sides and is three-dimensional. What are some of the other dimensions of this problem?

President Griswold and Mr. Fadiman have, in their strictures upon the taste and reading behavior of the public, dodged completely one of the most important issues of our time. This issue is that *the rapid communication of intelligence to all the people is an absolute requirement for survival.* Ogden and Richards (a source not too far outside the mainstream of literary thought) have said in their great work, *The Meaning of Meaning* (p. x):

> New millions of participants in the control of general affairs must now attempt to form personal opinions upon matters which were once left to a few. At the same time the complexity of these matters has immensely increased. *The old view that the only access to a subject is through prolonged study of it, has, if it be true, consequences for the immediate future which have not yet been faced. The alternative is to raise the level of communication. . . .* (Italics mine)

Does President Griswold honestly believe that the level of communication can be raised on atomic energy, flood control in

the Missouri Valley, and the problems of a turbulent Orient by reference to a reading list of Thomas Jefferson's *circa* 1800? Or would he add all the books in print in the Western world since that time—a collection which could not be housed in all the buildings of his own university, let alone in its magnificent library. Who would do this reading? And when?

And then there's the matter of understanding what is read. Reading with understanding involves the manipulation of meanings—meanings of concepts and generalizations. Without meanings, reading is mere verbalizing, a skill that can be taught to a crow. Do Mr. Fadiman and President Griswold naively assume that meanings spring full-blown from words? Only a reader with a relatively high degree of sophistication *in the field in which he is reading* can derive meanings from context and words representing concepts for which he has a poor stock of meanings. Even President Griswold, for all his erudition, might not achieve too much communication with the author of a monograph on physical chemistry or on an investigation into the autokinetic phenomenon.

How, then, do concepts and generalizations become meaningful for an individual? The answer lies in the experience an individual has had. Thus, in America, elementary terms like *dog* or *automobile* are completely meaningful because almost everyone has seen, touched, and otherwise experienced these things. But what of *Chile*, and *Viet-Nam*, and *radio-active isotopes*? Before meaningful reading there must be experience, and can an aircraft worker in Burbank, or an advertising executive in New York, or a professor of English in Ohio experience all these things directly? Is President Griswold prepared to say that a documentary film on Chile, a television program featuring travelers from Viet-Nam, and a motorized exhibit on radio-active isotopes would not provide meanings which would help all Americans understand what they could then read on these subjects?

Or would he prefer that we make decisions on these matters based on a series of words which we have half picked up from newspapers and books about nitrates (what is a nitrate?), temples (what kind of a temple and for what?), and thyroid glands and iodine (what do they do and why?). The only alternative is a near lifetime of study on each subject, developing the meanings slowly, laboriously, and, if carried on without any reference to experience or representations of experience, even wrongly. Contrary to our literary fretters, I conclude that our forests of tele-

vision masts, our thousands of projectors, our techniques of quick display and communication are an absolute necessity, first, to raise the level of communication, and second, to actually achieve President Griswold's own objective of having people read with intelligence.

We come now to the heart of the problem, *time*. Dr. Griswold speaks of the Colossus of leisure time that will create muscle and mob-men if they do not use this time for reading and reflective thinking. I concur with his basic idea that people must deal with serious and beautiful matters instead of trivial and trashy ones if we are to achieve true humanity. But I submit that the leisure time of which he speaks is more of a delusion than a reality. The gentlemen who had the leisure to read were Hamilton, Jefferson, and the others—there was real leisure time with servants, cooks, and clerks to take care of the basic business of living while the master read, wrote, and thought. There were exceptions, of course, but these could not have been too numerous.

In an urban society today, "leisure" time is used up in getting to and from work, in gardening and maintaining a house, in shopping, and in a hundred other ways. Most women in households with moderate income do their own work which, while lightened by labor-saving devices, still takes time. Time demands are greater than money demands today. A parking ticket received while trying to snatch a little time will take several hours out of what a former newspaper publisher used to call the *Time Bank*. The machines have brought us "leisure" which we must expend in keeping alive in a machine age. And in addition to keeping alive, the average person makes some sort of a try at a family life, a small amount of social communication, and, perhaps, some community service in an organization or two.

Don't forget, too, that the machine age is exhausting. An hour in heavy traffic and Aristotle is not too appealing, even, I suspect, to a graduate of St. John's. The dullness of a factory job has to be relieved by some escape after hours, escape from the exhaustion of machine boredom. No, President Griswold, the wonder is that we do so much intellectualizing in the time at our disposal.

Literary Cassandras would do well to examine the hundreds of study groups maintained by the PTA, for example—study groups that are not painting on some sort of an artificial veneer of culture, but that are making a sincere attempt to understand one of the most difficult phases of human relations, the rearing of

the young. Our culture is sprinkled throughout with groups of individuals studying world government, conservation plans, or numismatics. Writing off America on the basis of the total misuse of an illusory leisure time is not justified by the facts. President Griswold himself admits he has no time to read and he doesn't blame that on pictures.

If the problem is time, it is also amount—the amount of material that must be known today. We have to know about India, about world trade, about heart disease. Time is short and the amount of knowledge continually increases in geometric progression. It follows that we *must* use all the means possible to distribute this knowledge. We must, in fact, use "more efficient methods and processes" where they will do the job. And here Mr. Fadiman and President Griswold, in their fear of audio-visual communication, react like any fearful person—they show signs that their fear is derived from lack of knowledge. Mr. Fadiman, for example, speaks of a picture as "directly forgotten." Yet everything we know from research tells us that exactly the opposite of this is true. What is forgotten most readily are concepts *that are held only at the verbal level without meanings in support.* Pictures always come out best in tests of remembering.

Our literary friends are also apparently not familiar with research in communications behavior. The fact that most adults do not read books is tempered by the fact that there is a marked tendency for those who don't read also not to attend movies or listen to the radio. Charles F. Hoban pointed out in an address before the Fourth Annual Michigan Audio-Visual Conference in 1949 that ". . . there is a relationship between participation in any of the modern media and participation in all modern media. Rather than fight each other—as it has been supposed—radio, movies, and books and magazines tend to reinforce each other, so that those who abstain from one tend to abstain from the others, and those who patronize one tend to patronize the others."

When we examine what adults voluntarily like in the form of reading, combinations of text and pictures, such as *Life* magazine presents each week, rank very high. Furthermore, research done at Harvard in 1933 by Rulon established the fact that *combinations* of films and text rated superior on every count (recall, et cetera) for general science subject matter *three months after exposure.* Here are implications for President Griswold, the book publishers, and Mr. Fadiman! More efficient methods and processes are needed, and here are some clues as to what might be done.

It may have escaped the *literati*, but the Fund for Adult Education of the Ford Foundation has been aware of these implications and is doing something about them. Right now the Fund is very successfuly using a combination of specially written essays and films on all types of serious topics with adult groups. Reports on the use of these combined materials at weekly meetings of Rotary Clubs, labor unions, and so on indicate that the method is producing astounding results in the form of intelligent discussion and broad thinking.

After all this, it would seem that I am in violent disagreement with President Griswold. And yet I am not. I abhor what he abhors—trashy television, mammary novels, the half billion or so comic books sold in the United States each year, the general absence of interest in ideas, the venality of much of the press (Dr. Griswold should live on the West Coast!), and Class X double features. But Griswold (and Fadiman—and John Mason Brown and many others) offer no solution.

We must first have faith that the people are not as bad as they are painted. They are a long way from being beasts and "thing-men." There are a lot of beasts and "thing-men" in advertising agencies, in publishers' offices, and in radio, television, and motion picture circles. But, on the other hand, for example, examine the quality of the articles in the *Ladies Home Journal* as compared with 20 years ago and ask if this does not represent progress; so the *Reader's Digest* has maneuvered into the ridiculous position of becoming a "medical" journal; what about the excellent syndicated articles recently appearing in many newspapers on medical topics. Given help, the people will seek quality.

Second, modern life is putting an intolerable burden on everyone in terms of what is to be known and thought about, the difficulty of the concepts involved, and the time necessary to do the job. Intellectuals of good will must bend every effort to solve this problem. All means, including the audio-visual (and the extrasensory, if possible), must be used to help people develop meanings so that they may think clearly and have the desire and ability to read widely. Then and only then will we achieve Dr. Griswold's objective.

Third, we must adapt television, films, radio, even comic books and displays to the rapid communication of intelligence where reading is not possible or profitable in terms of time, energy, or ability. We must wage constant war on the thing-men in the ad-

vertising agencies and other places where they control the media of communication so that real ideas and materials can be transmitted instead of trash. This war cannot be waged directly in most cases, but by example and creative effort. The first question I would ask President Griswold is, "What is Yale University doing about television, and radio, and audio-visual processes?" What Yale does in its community and in the nation to use the mass media to better ends, and what P.S. 29 does, and what the Plumbing Society of South Paducah does will make the difference. Castigation is only helpful when followed by creative effort.

Finally, all of the ringers of the *Belles Lettres* had better take a good look at themselves. As I said before, basic to their whole viewpoint is a scale of values which insists on putting the reading of certain works on a higher value plane than a thousand other rigorous intellectual activities now pursued by man. Literary gentlemen should recognize that many people other than themselves accept the same basic values they do, but realize that these values may be achieved in many ways. Intellectual activities may be diverse without being ranked; humaneness may be achieved through science or cookery or even educational method, and communication can take place in efficient ways without ruining the ideas communicated in the process.

AV ACTIVITIES OF COLLEGES AND UNIVERSITIES IN TEACHER EDUCATION

● ROBERT E. de KIEFFER

*This is the third and final * article devoted to the study of the pre-service and in-service education of teachers in audio-visual methods and techniques throughout the United States. Robert E. de Kieffer is associate professor of education and director of the Bureau of Audio-Visual Instruction, University of Colorado.*

THE PURPOSE of this study is to report the audio-visual activities of four-year institutions. Information is presented concerning: (a) the type and number of credit hours given for courses in audio-visual education; (b) when such courses were offered (summer, academic year, extension); (c) the percentage of June graduates completing audio-visual courses; (d) the content of basic courses along with the type of equipment and facilities used; and (e) the composition of the teaching faculty.

Not only are four-year institutions concerned with the pre-service education of teachers, but they also play a vital role in offering advanced education to in-service teachers. Most of the institutions of higher learning which are engaged in teacher education are committed to a program of assisting teachers in the field by means of graduate study, workshops, clinics, conferences, short courses, publications, and similar activities. Because of the relatively recent development of electronic tools of communication, the in-service education in the audio-visual field is considered of major importance in the improvement of instruction throughout the nation.

* Persons wishing to purchase a microfilm copy of the entire study should write to Dr. Henry Waltemade, Associate Director, Norlin Library, University of Colorado, Boulder, Colorado, and request Robert E. de Kieffer's "A Decade Study of Audio-Visual Activities in Teacher Education in the Forty-Eight States, 1947-1957."

BASIS FOR CONCLUSIONS

For the purpose of this study, only four-year institutions of higher learning, which were basically concerned with teacher education, were considered.

Ten years ago, the author selected Carter V. Good's *A Guide to Colleges, Universities, and Professional Schools in the United States* [1] as the reference source for selecting the institutions to be included in the original study. For the current study, *Lovejoy's College Guide*, was the basic reference.[2] This volume includes a listing of 2189 colleges and universities; however, for the purpose of this study, several groups of institutions were eliminated, namely, junior colleges, trade schools, military academies, and special service schools, as well as medical and similar professional schools. Of the total number of 2189 colleges and universities listed by Lovejoy, only 1097 were selected for study.

The method of procedure in conducting the survey in 1957 differed from that used in 1947. In the earlier survey, all four-year institutes selected were contacted and asked if they had an audio-visual program, and, if so, would they be willing to participate in the survey. In 1957 this step was eliminated and the original letters with the questionnaire enclosed were sent directly to the selected four-year institutions. For this reason, the percentage of returns and the number of institutions reporting the extent of their audio-visual activities is notably higher.

In 1947, of the 905 four-year institutions of higher learning contacted, 594, or 66 percent, responded to the original inquiry. Of this number, 223 stated that they conducted an audio-visual program and would be willing to participate in the study. However, when the questionnaires were sent, only 180 institutions completed them. Twenty-two institutions had to be eliminated from the study because of the limitations of their programs. In the final analysis, only 152 institutions were considered and reported in the earlier study,

In 1957, of the 1097 institutes which were sent questionnaires, 898 or 85 percent replied. Of this number 560 claimed that they were conducting audio-visual programs, and their replies were tallied.

It should be recognized that, because of the difference in the procedures used in collecting data in 1947 and 1957, there is a

[1] Good, Carter V. *A Guide to Colleges, Universities, and Professional Schools in the United States.* Washington, D. C.: American Council on Education, 1945. p. 681.

[2] Lovejoy, Clarence E. *Lovejoy's College Guide.* New York: Simon and Schuster, 1956-57. p. 264.

danger in making broad generalizations or comparing the findings of these two studies. Quite obviously, the 1947 study was a highly select group of institutions with a staff who were interested enough to desire to have their institution included in the original study. In addition, studies of this type are quantitative in nature and do not indicate the quality of programs. Finally, a questionnaire survey can never be definitive because of the semantic difficulties involved in interpreting word symbols between author and respondent.

However, in spite of these difficulties, this study is important in recognizing trends, broad objectives and general practices in the pre- and in-service education of teachers in audio-visual education, as conducted by the majority of four-year institutions in the United States.

Among the questionnaires returned from institutions which did not have a program on which to report were many interesting and significant comments. Forty-one institutes in this group stated that the questionnaire did not apply to them because they either did not offer education courses or because they offered graduate courses only. Thirty-two institutions reported that work in audio-visual methods and techniques was combined into existing methods courses and that no additional course work was offered. Seven replies indicated that the college administrators did not believe in separate audio-visual courses. Eight institutions, although they had no specific audio-visual courses, reported that they provide audio-visual services to their staff members. Finally, 35 institutions claimed that while they had no formally organized program, 100 percent of their staff made use of audio-visual materials in their teaching.

FOUR-YEAR INSTITUTIONS HAVING AUDIO-VISUAL PROGRAMS

Data compiled from the questionnaire replies, both in 1947 and 1957, show that there is a direct relationship between the size of the student body of an institution and the probability that it is conducting an audio-visual program. (See Figure I.)

Of all institutions of higher learning which answered the questionnaire in 1957, 62 percent reported that they had an audio-visual program, while in 1947 only 41 percent made such claims.

It is interesting to note that a large number of denominational colleges and universities answering the questionnaires in 1957 have inaugurated audio-visual programs within the past 10 years. The

rapid growth in the number and percentage of institutions now conducting programs seems to indicate the acceptance of instructional materials and their impact on teaching and learning.

COURSES OFFERED IN AUDIO-VISUAL EDUCATION

Number of Courses

According to the replies received and tallied from 560 institutions offering courses in audio-visual education in 1957, the

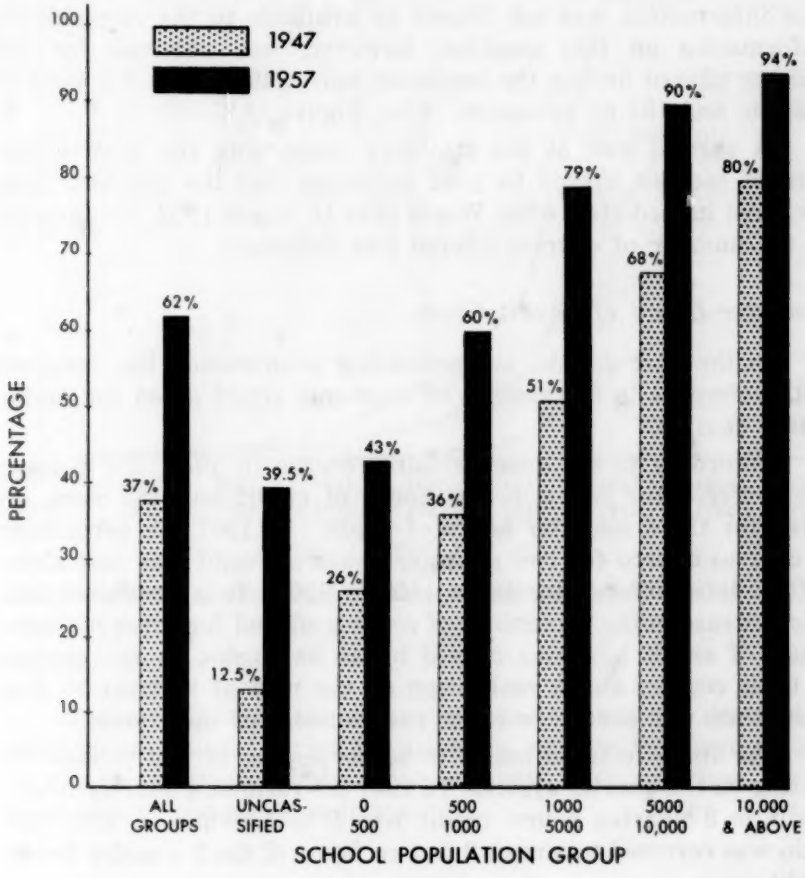


Figure I

1947 and 1957—The Percentage of Four-Year Institutions Having Audio-Visual Education Programs

method by which such offerings are given varies widely from institution to institution. Some institutions offer a course or courses only during the academic year. Others offer courses only in the summer, while a few offer them only by extension. Many institutions disclosed that they are offering courses by all three methods. The questionnaire response indicated that 560 institutions were offering a total of 846 courses during the academic year, 569 during the summer session, and 236 by extension.

In answer to the question, "When were these courses first offered?" several institutions failed to reply, presumably because this information was not known or available to the respondents. Information on this question, however, was received for 732 courses offered during the academic year, 349 during the summer session, and 134 by extension. (See Figure II.)

A careful look at the statistics concerning the growth pattern of courses offered by year indicates that the greatest jump occurred immediately after World War II. Since 1952, the increase in the number of courses offered has stabilized.

Semester Hours of Credit Given

In the past decade, an interesting phenomenon has occurred with reference to the amount of academic credit given for audio-visual courses.

According to the questionnaire returns in 1947, 132 courses were offered for two semester hours of credit and 157 were offered for three semester hours of credit. In 1957 the percentage of courses offered for two semester hours of credit was just about half of those offered for three (459 to 856). It is presumed that this increase in the percentage of courses offered for three semester hours of credit has been caused by an expansion in the content of basic courses and a realization on the part of instructors that more time was needed to cover the material of the course.

The opposite trend seems to be developing in institutions operating on the quarter system. In 1947 the ratio of 4 quarter hours' credit to 3 quarter hours' credit was 5 to 1, while in 1957 this ratio was reversed to almost 2 to 1 in favor of the 3 quarter hours' credit.

The policy of allowing hours of credit for these courses holds true for residence courses offered in the academic year, in the summer sessions, and by extension.

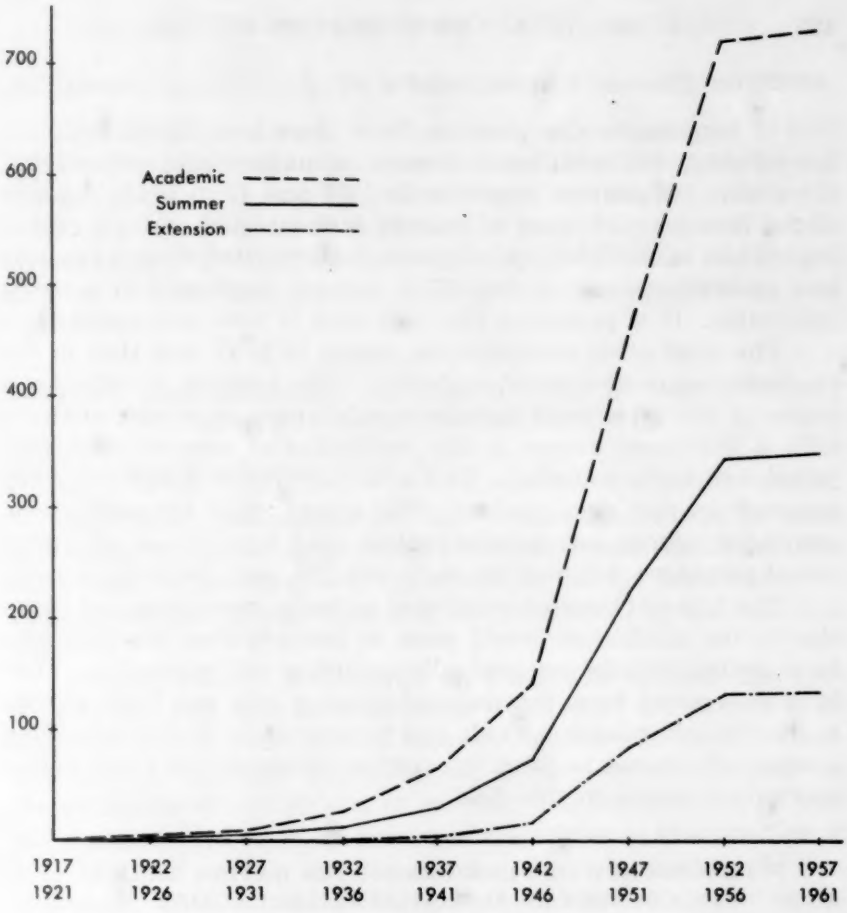


Figure II

Development of Audio-Visual Courses Offered by Four-Year Institutions

Average Size of Class

A comparison in the mean number of students enrolled in audio-visual courses during the academic year, in the summer, and by extension shows no significant change. A comparison in the mean size of classes is as follows:

	1947	*1957*
Academic Year	28	26
Summer	31	30
Extension	26	29

Additional Courses Contemplated

In response to the question, "Are there any immediate plans for offering any additional courses in audio-visual education?" there were 107 courses suggested in 1957 and 47 in 1947. A study of the frequency of types of courses contemplated is quite revealing. While in 1947 the type of course contemplated most frequently was an extension course, in 1957 it was not mentioned by a single institution. It is presumed that this area is now well covered.

The most often contemplated course in 1957 was that in the *production of audio-visual materials.* The interest in offering a course of this type seems to indicate a felt need to provide students with a laboratory course in the production of nonprojected, projected, and audio materials. This area can only be given a cursory overview in the basic courses. The second most frequently contemplated course was administration and supervision of audio-visual programs, followed by radio and TV, and graduate courses.

The types of courses mentioned as being considered for inclusion in the curriculum would seem to indicate that the programs in many institutions are gradually maturing and expanding. They have progressed from the point of offering only one basic service course in audio-visual methods and techniques to that of providing a series of courses to meet the current demands for more highly specialized people in this field.

PERCENTAGE OF JUNE GRADUATES HAVING TAKEN COURSES IN AUDIO-VISUAL EDUCATION

An attempt was made to ascertain the percentage of June graduates who have had at least one course in audio-visual education. In both 1947 and 1957, several institutions stated that all of their graduates had completed such a course. Other institutions, especially those which offer audio-visual courses only during the summer, indicated that none of their graduates had taken such a course. The tabulations indicate the following facts:

Year	*Total Replies*	*Range*	*Mean*
1947	126	0-100	28%
1957	436	0-100	38%

One of the reasons for this increase may be the effect of requirements in the state certification laws and the increasing awareness by colleges of education of the importance of this field.

ACADEMIC YEAR STUDENTS WERE ADVISED TO TAKE COURSES

A study of the data as to when students were advised to take courses in audio-visual education does not reveal any significant changes during the past 10 years. There is a slight shift in the order of preference. In 1947, the senior year was mentioned most often. In 1957 this preference dropped to third choice as opposed to first, Junior and Senior, and second, Junior, Senior, and Graduate.

CONTENT, MATERIAL, AND EQUIPMENT USED IN INTRODUCTORY COURSES IN AUDIO-VISUAL EDUCATION

Material and Equipment Used

Few other professional courses in education require as much laboratory equipment as do courses in audio-visual education. Students must be provided with opportunities for the development of skills in equipment operation and the production of teacher-made materials.

For this reason, institutions were asked to indicate the types of materials and equipment available for student use or instructor demonstration in introductory courses. Option was given to indicate whether students were required to learn to operate and use the materials or equipment, or whether the instructor only used and demonstrated them. A review of the replies to this question in 1947 and 1957 reveals that there was a slight increase in the percentage of institutions which required students to operate equipment. The author believes that, in this instance, comparisons can be made between these two sets of data, because both sets deal with procedures used in introductory courses, and they represent fair samples of all similar courses taught throughout the nation.

There was a slight drop in the percentage of institutions reporting that students were required to handle or operate the following types of materials or equipment: classroom radios; motion picture cameras; still cameras; flat pictures; charts and posters; maps and globes; objects, specimens, and models; exhibits and dioramas; and darkroom equipment.

The most noticeable increase was the use of recording equipment. This shift in emphasis is probably due to the recent improvements made in tape recording equipment.

There was a noticeable decrease in the percentage of institutions which reported that only their instructors demonstrated the

operation or manipulation of equipment and materials. And only three types of materials showed an increase in instructor demonstration—microfilm readers, maps and globes, and exhibits and dioramas.

Content of Introductory Courses

The availability and use of equipment and materials in introductory audio-visual courses is important; however, the actual content of these courses is of primary concern. A list of 10 areas generally included in introductory courses was given in the questionnaires, along with an opportunity for writing in other areas concerned. The respondents were asked to check those areas which were included in their own course. With a few minor shifts in terms of the number of times areas were mentioned, the replies indicated that a decade had made little change in the content of introductory courses.

In 1957 the areas covered are listed below in the order of the greatest number of replies.

1. Operation of Equipment
2. Utilization of Materials
3. Evaluation of Materials
4. Selection of Materials
5. History and Philosophy of Audio-Visual Education
6. Administration of Audio-Visual Programs
7. Production of Nonprojected Materials
8. Production of Photographic Materials
9. Production of Radio Scripts, Transcriptions and Recordings
10. Other Types of Production

It is interesting to note that administration of audio-visual programs is still considered to be of greater importance than the production of teacher-made materials in introductory courses.

ADMINISTRATIVE CONSIDERATIONS

The degree to which any program is accepted on the campus of an institution may be measured in terms of the amount of administrative consideration which is given to it. In an attempt to determine the administrative consideration given to audio-visual programs, a series of four questions were asked.

1. Does your institution have a formally recognized department of audio-visual instruction?
2. Does your institution recognize audio-visual education as an area for graduate study?

3. Does your institution allow students to specialize in audio-visual education as a major field of concentration?
4. Does your institution allow students to specialize in audio-visual education as a minor field of concentration?

Formally Recognized Departments

In 1947, 28, or 18 percent, of the 152 institutions reporting indicated that they had formally recognized departments. In 1957, of the 560 institutions reporting, 78, or 14 percent, made such claims. Both surveys indicated that the school or college of education was responsible for teaching these courses. Other schools and departments mentioned, in the order of the number of replies received, were psychology, library science, religious education, industrial arts and vocations, business, administration, and the graduate school.

Recognized Area for Graduate Study

The 1947 survey revealed that 51 of 152 institutions, or 33 percent, recognized audio-visual education as an area for graduate study. The 1957 survey indicated that 131 of 560 institutions, or 23 percent, gave such recognition. It should be remembered that many four-year institutions of higher learning do not operate a graduate program. However, there are 131 institutions which are currently committed to graduate level work in the audio-visual field.

Specialization in Audio-Visual Education

While many institutions recognize audio-visual education as an area for graduate study, a relatively smaller number allow students to specialize in it as a major or minor area of concentration.

In 1947, 28, or 18 percent, of the institutions replying stated that students could specialize in audio-visual education as a minor field of concentration, while in 1957, 58 institutions, or 9 percent, made such claims.

Allowing audio-visual education as a major field of concentration in 1947 was reported by 13 institutions, or 8 percent, while in 1957, 44 institutions, or 8 percent replying, averred that this was the case. Several institutions claimed that the audio-visual field did not have enough content for specialized attention. Others reported that this field was considered as a segment of the larger area of communication.

Composition of the Staff

The number of degrees held by teaching personnel does not always reflect the type of teaching which is being done. However, the number of persons holding advanced degrees does indicate a certain amount of maturity and acceptability in any educational field. Approximately one-third of the teaching personnel in 1947 held either Ph.D. or Ed.D. degrees. In 1957, slightly less than one-third held such degrees.

It is interesting to note that according to the replies received, the Ed.D. degree seems to be increasing in popularity. There was a slight percentage decrease in the number of master's degrees held during these two periods.

These figures seem to corroborate the findings of the research study, *Teacher Supply and Demand in Colleges and Universities* recently published by the NEA.[3]

Laboratory Facilities for Audio-Visual Education

The teaching of audio-visual methods and techniques necessitates the study of various types of material and equipment. It is quite obvious, therefore, that some type of a special laboratory or room be used for this purpose.

Many institutions have found it advisable to establish a separate room or laboratory where such equipment and materials can be centrally housed. These centers or laboratories are used for training students in equipment operation, preparation of teacher-made material, and for previewing and auditioning projected and audio materials. In 1947, 96, or 63 percent, of all institutions replying disclosed that such a laboratory was available on their campus. In 1957, 291, or 52 percent, so replied. Of those institutions reporting a laboratory in 1947, 86, or 81 percent, stated that audio-visual classes were conducted in these laboratories. In 1957, 230, or 79 percent, made such claims.

CURRICULAR CONSIDERATIONS

The extent to which audio-visual education is affecting and affected by other professional courses is an important consideration in measuring the impact which this field has upon teachers. It was felt advisable, therefore, to determine the extent to which institu-

[3] National Education Association, Research Division. *Teacher Supply and Demand in Colleges and Universities, 1955-56 and 1956-57.* Washington, D. C.: the Association, 1957. p. 76.

tions were integrating audio-visual education in their total educational program. Such integration included the following:

1. Including short units of audio-visual education in other professional courses.
2. Expecting students to use audio-visual materials in their practice teaching.
3. Expecting critic teachers to demonstrate the utilization of audio-visual materials in their classroom teaching.
4. Desiring faculty members who offer other courses in education to use audio-visual materials in their classes.

Short Units of Audio-Visual Education

From the replies received, it appears that the larger the institution the more likely it is that short units of audio-visual education are included in other education classes.

In 1947, of the 152 institutions replying, 114, or 75 percent, indicated that such units were included in other courses, such as methods courses, et cetera. In 1957, of the 560 institutions returning questionnaires, 422, or 75 percent, made such claims. Probably the best explanation for the large number of institutions practicing this technique is the feeling that an introductory audio-visual course gives students a general background and short units in other courses pinpoint specific applications.

Audio-Visual Materials and Practice Teaching

Good educational psychology supports the theory that students learn best and retain more if they are allowed to practice a skill shortly after it has been demonstrated and explained. It would seem most logical, therefore, that students be expected to use audio-visual materials in their practice teaching.

In 1947, of the 152 institutions replying, 122, or 80 percent, stated that this type of work was expected. Ten years later, 374, or two-thirds of the 560 replying, stated that this was the case.

There appear to be many reasons why more students are not expected to use audio-visual techniques in their practice teaching. Among the more obvious ones are the following:

1. Students are not required to take courses in audio-visual education.
2. Students take an audio-visual course simultaneously with or following their practice teaching.
3. Lack of laboratory schools, large numbers of students, and difficulties of close supervision.
4. Lack of audio-visual equipment and material in cooperating schools.

Utilization of Audio-Visual Materials by Critic Teachers

Critic teachers who have under their jurisdiction one or more practice teachers can do much to help these students learn effective teaching techniques by the demonstration method.

In an attempt to determine the extent to which critic teachers in various subject matter areas demonstrated the utilization of audio-visual materials, one of four responses was possible—"none," "slight," "some," and "considerable." The 1947 and the 1957 figures are approximately the same, in terms of the distribution of replies received.

A few institutions indicated that no attempt is made by critic teachers to demonstrate such utilization techniques. Between 18-20 percent suggest that such practices are engaged in to a slight extent, and approximately one-half of the institutions replying indicated that some attempts are made in this direction. Finally, approximately one-quarter of these institutions stated that considerable emphasis is placed on utilization techniques of audio-visual materials in the classroom teaching of their critic teachers.

Use of Audio-Visual Materials in Other Professional Courses in Education

If instructional materials are really valuable in the learning and teaching situation, it would appear likely that they should be used by faculty members who offer courses in education. When the question was asked, "Approximately what percentage of instructors use audio-visual materials in their classes?" both studies revealed a range of 1-100 percent. In 1947 the mean percentage was 63. In 1957 the mean percentage was 76.

An interesting phenomenon can be noticed in the mean percentage in terms of school size in the 1957 survey. The smaller the school the greater is the percentage of teacher use. This might be explained by the close personal association of the respondent with the faculty and an intimate knowledge of their teaching techniques.

REQUIREMENT CONSIDERATIONS

Mention has already been made of the fact that some states require candidates for permanent teaching certificates to have at least one course in audio-visual education. It is presumed, there-

fore, that institutions which are training teachers in those states will require their students to take such a course. Many other institutions not affected by state certification laws have established their own set of requirements concerning courses which students must take prior to graduation. For this reason, institutions were asked if there were any type of requirements, state or local, which made it mandatory for students to take a course in audio-visual education.

In 1947, 51, or one-third, of the responding institutions reported in the affirmative. In 1957, 231, or 41 percent, made such a report. By far, the greatest single reason given during both years was the state department requirement followed by institutional requirements.

MAJOR OBSTACLES

There are usually a great number of reasons why progress is slow in developing any new program in institutions of higher learning. Conducting audio-visual classes is no exception. The institutions were, therefore, asked to list some of the major obstacles in conducting audio-visual classes on their campuses. A list of six of the most generally suggested obstacles was given, followed by a write-in blank for explanation. Of the replies received, many were checked in more than one place, indicating multiple obstacles. An interesting shift has taken place over the past 10 years. While it is difficult to make comparisons between the 1947 and 1957 replies, the author feels that both groups of respondents were so similar in nature that the responses on this subject can be studied together.

The greatest change is not in the number of new obstacles mentioned, but in the relative importance which they received. For example, the "lack of building space" in 1947 was mentioned by the greatest number of people. In 1957, it had dropped to fourth place. Faculty apathy rose from fifth to first place.

IN-SERVICE TEACHER EDUCATION ACTIVITIES

Institutions engaged in the education of teachers are vitally concerned with the quality of their product and are interested in the continuing professional advancement of their graduates. In addition, the close relationship between professional educational schools, departments, and colleges with the local and regional ele-

mentary and secondary schools makes it mandatory to devote attention to the in-service education of teachers. In an attempt to determine the nature and extent of services which responding institutions were giving to in-service teachers in the audio-visual field, they were asked to indicate in which of the following six activities they are participating: (a) offering short courses in audio-visual education; (b) offering correspondence courses in audio-visual education; (c) sponsoring conferences and institutions in audio-visual education; (d) assisting individual schools in organizing in-service education programs in audio-visual education; (e) publishing materials specifically for in-service teachers in audio-visual education; (f) maintaining school visitation service to assist individual schools with their audio-visual problems.

Table 1 indicates the number and percentage of institutions which are assisting with the education of in-service teachers in each of these six areas.

Care should be taken in making analogies between the 1947 and 1957 figures because of the larger number of schools contacted in the 1957 survey. The selectivity of institutions in the 1947 survey may partially explain the higher percentage of participation in all categories.

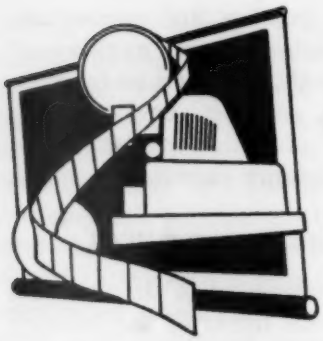
TABLE 1.—THE NUMBER AND PERCENTAGE OF INSTITUTIONS ASSISTING WITH THE TRAINING OF IN-SERVICE TEACHERS BY CONDUCTING EACH OF SIX ACTIVITIES, 1947-1957

Activities	*Number*		*Percent*	
	1947	*1957*	*1947*	*1957*
1. Offer short courses in audio-visual education	49	147	32%	26%
2. Offer correspondence courses in audio-visual education	5	18	3	3
3. Sponsor conferences and institutes in audio-visual education	64	130	42	23
4. Assist individual schools in organizing in-service education programs in audio-visual education	59	173	39	31
5. Publish materials specifically for in-service teachers in audio-visual education	30	88	19	16
6. Maintain school visitation service to assist individual schools with audio-visual problems	36	88	24	16

Probably of greater interest than the number and percentage of institutions participating in these services is the ranking of their importance. The 1957 survey reveals this ranking as follows: *first,* assisting individual schools; *second,* offering short courses; *third,* sponsoring conferences; *fourth,* school visitation; *fifth,* publication of materials; and *sixth,* correspondence courses.

INSTITUTIONS MAINTAINING FILM RENTAL SERVICES

In the past, there has been some discussion as to the financial advisability of institutions maintaining film libraries for renting films to schools. Several schools returning the 1957 questionnaire stated that they believed that it was not only their duty to train teachers in the newer media of communications, but also to supply them with audio and visual material. Of the 560 institutes returning questionnaires, 137, or 24 percent, maintain a film rental service. The larger the institution the greater is the possibility that it will have such a service. A few institutions stated that the nature and general purpose of their institution precluded the possibility of their ever inaugurating such a service.



FILM

• ROBERT W. WAGNER*

THREE FILMS WORTH SEEING

Lewis Milestone, who directed the classic film version of *All Quiet on the Western Front,* once remarked: "All you need to be a genius in the motion picture business is a camera and a good memory." The writer was reminded of this somewhat oversimplified statement as he watched Charles and Ray Eames's latest film, *The Information Machine.*[1]

The film points out that while most men reach goals and make decisions by random or chance methods, there are those who are more observant, more able to recall and relate their recollections to present problems in a meaningful way. These men are seldom bored with anything. They are constantly building up stores of information in "memory banks" which can be drawn on for specific needs. The degree to which this process is operative makes people normal, bright, or, as Mr. Milestone of the motion picture business put it, "genius."

As the vast amount of information with which man has to cope has increased, however, he has developed tools to store up, recall, and to help him reach decisions and make predictions on a grand scale. Information machines, in the primitive form of a knotted rope or an abacus, and in the modern form of the electronic calculator, have developed because the complications of society have simply made them necessary.

The electronic computor as an information machine, the film points out, may be used in three different ways: (a) as a control

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[1] International Business Machines. Color; 11 min.; Sale: apply IBM; Rental: $8, Creative Film Society.

or balance, in terms of cost accounting, the logistics of raw materials, the history and performance of tools, and so on; (b) as a function of design, a problem which the machine can attack in infinite variety; and (c) as a simulation or model of life where we can see the results before taking the action.

Obviously, the latter is the most challenging use, since the information machine might, if properly supplied with data, be used to develop working models of living communities as well as industrial plants, communications systems, and the like. "The calculator," states the narration, "is helping to define society's most complicated problems. It is a tool for turning inspiration into fruitful prediction." The task of selecting data continues to be man's responsibility. If he assumes that responsibility and holds this Aladdin's lamp wisely, it can be used, according to *The Information Machine*, "to fulfill our highest wishes, and to bring a new dignity to mankind."

Technically, this film is a combination of animation with certain live action sequences. The drawings by Dolores Cannata and the music by Elmer Bernstein are both highly stylized. The rococo style of the art work which gives the picture the appearance of an old-fashioned valentine is a little out of character in view of the simple theme. There is somewhat too much attention to the technical style in the production, although the idea gets through effectively in the key sequences.

The complete title of this film is *The Information Machine or Creative Man and the Data Processor*. Pains have been taken to show man as the master, not the slave, of the IBM machine, despite which, it is pointed out "there will still be room for those smallest details that have been the basis for man's most rewarding wishes." The wishes are symbolized visually as a rose, a leaf, and a heart.

The fact that we have not quite worked out this delightful and highly desirable relationship between man and machine in our increasingly complex and automated society is suggested in another film euphemistically titled, *Have I Told You Lately That I Love You?* [2]

Produced by Stuart Hanish and other graduate students at the University of Southern California, this is a symbolic record of one day in the life of an upper middle-class American family from the time the alarm rings and the automatic coffee-maker switches on

[2] Department of Cinema, University of Southern California. Black and White; 16 min.; Sale: $60; Rental: $3.

in the morning, to the viewing of the late, late show on television. The effect of the interdependence of man and machine is illustrated by interweaving the husband's day at his electronically-serviced office with the wife's management of her equally automated home. His bouts with traffic controls, intercom systems, automatic elevators, cigarette machines, and dictaphones are intercut with his wife's engineering of automatic dishwashers, telephones, and the synthetic companionship of radio and television sets. Through it all wanders Junior, his life touching only at points on that of his parents who themselves are brought together only in brief and casual moments of their waking lives.

Although the setting is distinctively Los Angeles, California, and the pace clearly metropolitan, this is a sobering look at what is happening to a growing segment of our increasingly complex society. No intellectualized commentary is needed to make the point. The live sounds on the track are fragmentary and even crude; the visual pacing perhaps a bit too hasty; the editing at times bordering on sheer *tour de force*.

The over-all effort, however, reflects the fragmentation and cacophony of modern living. The very ambiguity of the ending, and the disturbing, if not depressing, image left by the film should make it a stimulating discussion piece for groups interested in human communication, and for college-level classes in sociology and social psychology.

A companion-piece to this film might be the image of a primitive contemporary society represented in the beautifully photographed picture, *The Hunters*,[3] by John Marshall and Robert Garden.

A fine example of the documentary approach, *The Hunters* is an interesting contrast to *Have I Told You Lately That I Love You?* The story is leisurely told, the editing slow-paced, the commentary lean and simple. It portrays the elemental struggle for food which occupies most of the West African Bushman's waking hours: the women grubbing for edible roots and berries, the men out for red meat. The father's tools are his spear and his poisoned arrows; the mother's, a few crude utensils. Junior wanders through this film, too, perhaps a bit more purposefully than in *Have I Told You Lately That I Love You?* learning not from a television set, but by observing his elders and by practicing for the big hunt by bringing

[3] Film Study Center, Peabody Museum of Harvard University. 55 min. Distributed by Contemporary Films. Sale: Color $400, B&W $275; Rental: Color $40. B&W $25.

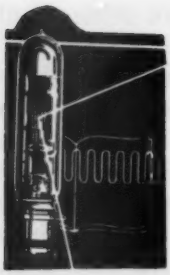
his miniature bow and arrow to bear on rabbits and other small game.

In contrast to the *hunter* of customers and clients, the *hunter* in this film is out for anything he can bring down and devour on the spot—in this instance, the tracking, killing, and butchery of a giraffe. The preparation for the hunt and the making of the poisoned arrows is shown, together with the stark conditions of existence that make it as necessary for the men to go out with bow and arrow as it is for the businessman to go out against the town armed with sample-case and expense account.

Without music, and with only the occasional use of sound effects, a segment of primitive society is presented in a way which encourages hope that the day of the documentary is not over, and the conviction that there is still a place for the quiet, simple, realistic film which details and preserves fragments of human life which will otherwise fade into the mists of history.

Have I Told You and *The Hunters* naturally do not present perfect parallels. The comparisons have to be made, analyzed, and reflected on. Certainly, there is no inference here that the simple, primitive life of the West African Bushman is better than the complex, sophisticated existence of the West Los Angeles Businessman. But in both films we see the dwellings, something of the daily tasks, and the technologies involved in these societies. The method by which at least a part of the cultural heritage is passed down to the children is suggested. We see something of the signs and symbols by which each of the two contemporary peoples live. The broken stalk of elephant grass means as much to the primitive hunter as the flashing light on an intercom system does to the stock broker. The call of a bird is as full of potential to the bush boy as the jingle of an ice cream truck is to the city kid. The material for thoughtful comparison is there.

In a way, the three films mentioned in this review form something of a trilogy. Looking at *The Hunters* against the backdrop of *The Information Machine* and *Have I Told You Lately That I Love You?* one thing seems clear. It is that while both primitive man and his contemporary sophisticate are still hunters, the latter is also a seeker. And that can make all the difference.



CURRENT DEVELOPMENTS IN COMMUNICATION

DOCTORAL DISSERTATIONS IN AUDIO-VISUAL EDUCATION: SUPPLEMENT II

• JOHN MOLDSTAD

Audio-visual communications and related aspects of administration, evaluation, and production continue to be fruitful areas for doctoral research. This compilation attempts to bring up to date the listings of doctoral dissertations in audio-visual education published in the Fall 1956 and Winter 1958 issues of AUDIO-VISUAL COMMUNICATION REVIEW. *John Moldstad is assistant professor of education and assistant in research at the Audio-Visual Center, Indiana University.*

Four hundred fifty-nine titles completed from the beginning up to March 1956 and 118 titles finished between March 1956 and September 1957 comprised the first two listings of doctoral dissertations in audio-visual education. Supplement II includes those doctoral studies completed between September 1957 and September 1958 plus additions to the previous two listings.

Letters requesting listings of studies completed during this period were sent to deans of schools of education and heads of departments of education in all United States institutions known to grant doctoral degrees in education. Deans of selected graduate schools, schools of communication, and schools of sociology also received letters. *Doctoral Dissertations Accepted by American Colleges and Universities* and *Dissertation Abstracts* served as sources, as did Phi Delta Kappa's *Research Studies in Education—1957* and entries received for the forthcoming 1958 issue.

SCOPE OF THE BIBLIOGRAPHY

As in the previous compilations, the bibliographical listings were confined to: (a) studies dealing with the effects of audio-visual

materials on learning, attitude formation, and human behavior in general, with the term "audio-visual materials" used in a broad sense so as to include not only educational but also commercial films, filmstrips, radio, television, comics, graphs, charts, pictures, and such; (b) doctoral dissertations concerned with evaluative or analytical studies of audio-visual administration, such as organizational structure, finance, selection, and distribution practices; and (c) other studies dealing with the structure and organization, content characteristics, audience, and effects of commercial and educational media of mass communication.

METHOD OF CLASSIFICATION

The author has again attempted to classify each bibliographical listing within the following broad categories, realizing that a classification system based solely upon dissertation title leaves much to be desired:

A. Administrative
   1. Administrative structure and practices—status and evaluation of audio-visual programs
   2. School plant facilities—provisions for audio-visual education

B. Audience
   1. Characteristics and habits—the characteristics and listening, reading, and viewing habits of various types of audiences
   2. Methodology—audience research methods

C. Media and Materials
   1. Content—studies of either the content of the media or of specific units of material or both
   2. Nature, structure, history—analytical or survey approaches in these areas
   3. Use and evaluation (nonexperimental)—programs of use in specific areas; analysis and evaluation of materials and their uses

D. Effect Studies
   1. Media—experimental studies dealing with the use of a specific medium or of media and analysis of the effects on a particular audience

2. Variables—experimental studies involving the following interrelationships:
    a. Stimulus constant and audiences or audience characteristics varied
    b. Stimulus varied and audiences or audience characteristics constant
    c. Both stimulus and audiences or audience characteristics varied
3. Utilization—experimental comparison of the effects of different methods of use of materials and/or media
4. Methodology—studies of methodology in appraising effects

E. Teacher Training
1. Methods and programs—audio-visual instruction as applied to teacher training
2. Teacher characteristics—attitudes regarding media and/or audio-visual instruction, and studies of desired competencies.

INTERPRETATION OF FINDINGS

The completion of 53 doctoral dissertations in audio-visual education during the past year from September 1957 to September 1958 confirms a continued interest in conducting research in this area. Table 1 contrasts the percentage of doctoral studies completed in various categories between 1956 and September 1957 with the percentage completed from September 1957 to September 1958.

On the basis of this percentage classification, there seems to be a general consistency in the categories of completed research studies for the two periods. A lessening in the number of administrative and audience studies is indicated, but limited numbers in these categories make any conclusions questionable.

Approximately half of last year's audio-visual dissertations concentrated on television and film with little effort applied to the study of such media as filmstrips, tape recordings, overhead transparencies, radio, et cetera. Surveys of instructional materials available in specific academic areas appear to be increasing. Unfortunately, the number of studies dealing with theory development, communication variables, content analysis, and audience analysis still is relatively small.

TABLE 1.—PERCENTAGE CLASSIFICATION OF DOCTORAL DISSERTATIONS IN AUDIO-VISUAL EDUCATION

Categories	*Percentage Classification of Completed Studies*	
	1956 to September 1957	*September 1957 to September 1958*
A. Administrative		
1. Structure and practice	10.8	5.8
2. School plant facilities	3.2	0.0
B. Audience		
1. Characteristics and habits	5.4	0.0
2. Methodology	1.1	0.0
C. Media and Materials		
1. Content	9.7	3.9
2. Nature, structure, history	6.5	9.6
3. Use and evaluation	33.3	42.3
D. Effect Studies		
1. Media	14.0	21.2
2. Variables	7.5	7.7
3. Utilization	4.3	1.9
4. Methodology	0.0	0.0
E. Teacher Training		
1. Methods and programs	3.2	7.7
2. Teacher characteristics	1.1	0.0

DOCTORAL DISSERTATIONS IN AUDIO-VISUAL EDUCATION

Supplement II

(C–3)* 1. ADKINS, BRYCE EDWARD. *A Topical Listing and Exploration of Selected Instructional Aids in Arithmetic.* State University of Iowa, 1958.

(D–2) 2. ASHER, JAMES JOHN. *An Investigation of a Group of Social Psychological Factors Related to the Impact of an Educational Television Program.* University of Houston, 1957.

(D–1) 3. BICHLER, DAVID L. *The Effect on Selected Science Education Objectives of a Sound Motion Picture with Accompanying Classroom Teaching Unit Concerning Poliomyelitis Presented to High School Students.* New York University, 1958.

(C–3) 4. BIGGAM, WILLIAM. *Instructional Aids in Industrial Arts Education.* Bradley University, 1958.

* The abbreviations in parentheses refer to categories defined in Method of Classification.

(E–1) 5. BOWMAN, DANIEL HAROLD. *The Preparation of Inexpensive Audio-Visual Teaching Materials, a Course for Teachers at Wayne State University.* Wayne State University, 1957.

(C–3) 6. BURGER, ELIZABETH. *The Use of Commercial Television for the In-Service Training of Fifth Grade Teachers in Elementary Science.* University of Virginia, 1958.

(C–3) 7. BYROM, JOHN MARVIN. *The Development of a Scale of Photographs for the Appraisal of Learning Influences in Industrial Arts Shops.* Pennsylvania State University, 1957.

(C–3) 8. CARTER, LOLITA P. *A Visual Aid for the Teaching of Modern Dance in High Schools.* State University of Iowa, 1958.

(C–3) 9. CLARK, WOODROW W. *A Study of School Photographs; A Scheme for Identifying, Classifying, and Indexing for Research Use a Large Body of School Photographs.* University of Mississippi, 1957.

(C–1) 10. CRIST, ANITA M. *A Study of the Quantitative Content of Selected Picture Books for Young Children.* Teachers College, Columbia University, 1958.

(D–1) 11. DENNY, EARL WALTER. *A Study of the Effectiveness of Selected Motion Pictures for Reducing Frustration in Children.* University of Washington, 1958.

(D–1) 12. DE PROSPO, NICHOLAS D. *Developing Scientific Attitudes by Responding Actively to Motion Pictures: A Study to Determine If Responding Actively to Selected Motion Pictures by Identifying the Problem-Solving Skills They Portray Reinforces or Develops a Scientific Attitude in College Freshmen.* New York University, 1957.

(C–3) 13. DUFFY, JOSEPH WILLIAM. *A Guide for the Fabrication of Pupil Made Dioramas in the Junior High Schools of New York City.* New York University, 1958.

(C–3) 14. DWORKIN, SOLOMON. *The Production and Evaluation of Four Sound Filmstrips on the Subject of Atomic Bombing, Designed as a Substitute for the Live Classroom Lecture: A Case Study.* Syracuse University, 1958.

(D–1) 15. EVANS, HAWTHORNE C., JR. *An Experiment in the Development and Use of Educational Field Trips.* University of Tennessee, 1958.

(C–1) 16. FELL, JOHN LOUIS. *Some Characteristics of Sponsored Films—A Comparison Between Sponsored and Educational Motion Pictures—A Study of High School Biology Films Issued in the United States in 1955.* New York University, 1958.

(C–3) 17. FRIEDMAN, IRWIN J. *A Handbook on the Selection and Use of Family Life Films With University and Cooperative Extension Groups.* (Joint Project) Teachers College, Columbia University, 1958.

(C–2) 18. GALE, FRANCIS CLAIR. *The Junior Museum and Its Program for the Education of Children.* Stanford University, 1957.

(C–2) 19. GIBBONY, HAZEL L. *The Instructional Materials Center in Teacher Education.* Ohio State University, 1957.

(A–1) 20. GILLINGHAM, LAWRENCE JOHN. *An Analysis of Methods of Evaluation and Selection of Audio-Visual Materials for Use in the Houston Independent School District.* University of Houston, 1958.

(D–1) 21. GLAZENER, EVERETT R. *An Experimental Determination of the Value of Selected Visual Aids in Teaching Beginning Mechanical Drawing.* Pennsylvania State University, 1958.

(A–1) 22. HAMILTON, DE FOREST SHAW. *An Evaluation of County Audio-Visual Services.* Stanford University, 1958.

(A–1) 23. HOLLOWAY, FRED. *A Plan for Making Use of Television in the First Presbyterian Church, Rutherford, New Jersey.* Teachers College, Columbia University, 1958.

(C–3) 24. HOWE, F. VIRGINIA. *Determination of the Relative Importance of Items of Content and Practice in Radio and Television Training Programs.* Boston University, 1958.

(D–3) 25. HUFFMAN, STANLEY AUSBURN, JR. *A Comparative Analysis of Four Instructional Methods in Eighth Grade Science.* University of Virginia, 1958.

(C–3) 26. KJELSON, LEE RICHARD. *The Development of Two Instructional Films for the Teaching of General Music in the Junior High School.* Iowa State University, 1957.

(C–3) 27. KLINK, ROWLAND. *A Survey of the Uses Made of Commercial Television Programs by Teachers in the Elementary Schools of Indiana.* Indiana University, 1958.

(D–1) 28. KREBS, ROBERT E. *The Effects of Educational Films on Student Perception.* University of Florida, 1958.

(D–1) 29. KURPIEWSKI, BOLESLAUS S. *The Effectiveness of a Modified Classroom Communicator in the Study of Learning Retention.* University of Oklahoma, 1958.

(C–3) 30. LICHTBLAU, LEONARD ROBERT. *Slides for Perceptual-Motor Skills—An Examination of Some of the Factors Which May Make Slides Effective in Teaching a Perceptual-Motor Skill in a Junior High School Industrial Arts Shop.* New York University, 1958.

(D–1) 31. LOFTHOUSE, YVONNE M. *An Experiment with Closed Circuit Televised Instruction in Teacher Education.* Wayne State University, 1957.

(E–1) 32. LOGAN, EDWIN MARION. *A Survey of Introductory Audio-Visual Laboratory Programs in Selected Colleges and Universities.* University of Virginia, 1958.

(C–3) 33. LUTTGENS, KATHRYN. *The Construction of a Film for Use in Instruction in Posture and Body Mechanics.* State University of Iowa, 1957.

(D–2) 34. MCCLARTY, EDWARD LEON. *Auding Ability Related to Achievement in Two Telecourses.* Stanford University, 1957.

(D–1) 35. MCELROY, CLYDE WAYNE. *An Experimental Study to Determine the Effect of Motion Pictures in Reinforcing Instruction for the Improvement of Speaking Techniques of Students in Beginning Public Speaking Classes.* University of Virginia, 1958.

(E–1) 36. MILLER, WILLIAM COOK, III. *A Proposal for the Reduction of Obstacles to Effect Use of Audio-Visual Materials Through In-Service Education Activities*

in the Schools of Wayne County, Michigan. Wayne State University, 1957.

(D–2) 37. MULLIN, DANIEL WEBSTER. *Retention as a Function of Motivation and Environment in Educational Television on the Secondary School Level.* University of Michigan, 1957.

(C–3) 38. NIVEN, HAROLD F. JR. *Instructional Television as a Medium of Teaching in Higher Education.* Ohio State University, 1958.

(C–3) 39. PAGE, JAMES L. *The Production of a Community Development Film and Its Effect on Opinions of Local Viewers.* University of Wisconsin, 1958.

(D–1) 40. PROSPER, ARTHUR FRANCIS. *An Experimental Study to Determine the Effectiveness of the Tape Recorder as a Teaching Device in the College Beginning Public Speaking Course.* University of Virginia, 1958.

(C–3) 41. RICE, CHARLES MASON MACDOUGALL. *Methods and Materials for Teaching Photography in the Secondary Schools.* Oregon State College, 1958.

(C–3) 42. SABAROFF, ROSE EPSTEIN. *A Framework for Developing Map Skills in Primary Grade Social Studies.* Stanford University, 1958.

(D–2) 43. SANDRON, LEO. *An Experimental Study to Determine the Effects of Proactive Set, Retroactive Set, and Lack of Set on the Learning Which Results from the Presentation of Instructional Films.* Oklahoma State University, 1958.

(C–3) 44. SHUBERT, CHARLES LOYD. *The Role of Audio-Visual Media in the Public Relations of Colleges of Teacher Education.* University of Nebraska, 1958.

(C–3) 45. SIUDZINSKI, EDWARD S. *A Study of Television and Viewing Habits, and a Comparison of These with the Interests and Habits of Radio, Motion Pictures, and Reading, as Shown by Students in Selected Senior High Schools in Metropolitan New York.* Fordham University, 1958.

(C–2) 46. SMITH, J. ASBURY. *Implications of Television for Industrial Arts.* Wayne State University, 1957.

(C–3) 47. STEVENS, RAYMOND H. *The Development of Two Experimental Sound Films in Teaching Elementary Music.* Iowa State University, 1958.

(C–2) 48. SWENSON, PATRICIA LOUISE GREEN. *Radio in the Public Schools of Portland, Oregon.* New York University, 1958.

(C-3) 49. TURNER, BILLY L. *An Evaluation of Selected Teaching Aids for Plane Geometry.* University of Houston, 1958.

(C-2) 50. TURNER, DEANE A. *A Study of the Effectiveness of Visual Aids in Farm Management Instruction Among Students of Senior High School Grades.* University of Minnesota, 1958.

(C–3) 51. WAGNER, JOSEPH. *A Handbook on the Selection and Use of Family Life Films with University and Cooperative Extension Groups.* (Joint Project) Teachers College, Columbia University, 1957.

(E–1) 52. ZIMMERMAN, HARRY PAUL. *An Evaluation of Pre-Service Audio-Visual Experiences in Selected Oklahoma Teacher Education Institutions Based on Reactions of Teachers and Supervisors.* University of Oklahoma, 1958.

* * *

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(C–2) 2. ANTONOWICH, ALEXANDER. *Television in Music Education.* Teachers College, Columbia University, 1949.

(C–3) 3. BERGESON, CLARENCE O. *Problems in Using Audio-Visual Materials in Selected Junior High School Core Courses.* Teachers College, Columbia University, 1956.

(C–3) 4. BRITTELL, ROBERT W. *An Analysis and Appraisal of the Two-Year Project of the Metropolitan School Study Council to Raise Public Understanding of Education Through a Series of Television Programs.* Teachers College, Columbia University, 1954.

(C–3) 5. COHEN, SAMUEL. *A Study of the Utilization of Audio-Visual Equipment and Instructional Materials Under Highly Desirable Conditions.* Teachers College, Columbia University, 1956.

(C–3) 6. EAST, MARJORIE S. M. *How to Use the Chalkboard, the Bulletin Board, and the Exhibit.* Teachers College, Columbia University, 1949.

(C–3) 7. ELLIS, J. C. *Approaches to Film as an Art Form; A Handbook for College Teachers.* Teachers College, Columbia University, 1955.

(D–1) 8. FRAZIER, ALEXANDER. *A Study of the Use of Unfinished Stories and Still Pictures in Classroom Situations and to Explore the Interpersonal Relations of Young Adolescents.* Teachers College, Columbia University, 1951.

(C–3) 9. GOLDSTEIN, BERNARD J. *The Comprehension of Poetry from Recordings.* Teachers College, Columbia University, 1952.

(C–3) 10. GOLDSTEIN, HAROLD. *Suggestions for Expanded Use of Radio in Adult Education Activities.* Teachers College, Columbia University, 1949.

(C–3) 11. HARTLEY, WILLIAM H. *Selected Films for American History and Problems.* Teachers College, Columbia University, 1940.

(A–1) 12. HILL, BENJAMIN J. *A Study of the Services Rendered by the Department of Library and Visual Aids.* Teachers College, Columbia University, 1942.

(C–3) 13. INGRAHAM, LEONARD. *An Audio-Visual Rationale and Manual for Social Studies Department of George W. Wingate High School, New York City.* Teachers College, Columbia University, 1957.

(C–2) 14. LIEBERMAN, IRVING. *Audio-Visual Instruction in Library Education.* Teachers College, Columbia University, 1955.

(C–2) 15. LUDLOW, DANIEL H. *The Instructional Materials Program of the Church of Jesus Christ of Latter-Day Saints.* Teachers College, Columbia University, 1957.

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BOOK REVIEWS

OSGOOD, CHARLES E.; SUCI, GEORGE J.; and TANNENBAUM, PERCY H. *The Measurement of Meaning.* Urbana, Illinois: University of Illinois Press, 1957. 342 p.

Reviewed by

• JOHN M. KITTROSS

With the extensive interrelationship between "meaning" and "communication," any title such as this one is bound to be intriguing. This volume should be especially interesting to the readers of this journal, because it is a report of successful research of high potential value to anyone interested in communication effects, as well as a discussion of the theoretical background of the question of meaning.

For the past seven or eight years, Dr. Osgood and his colleagues in the Institute of Communications Research at the University of Illinois have been working on an objective measure of semantic meaning. Use of the technique they have developed (called the "semantic differential") has spread to other educational institutions, the government and the advertising profession, among others. It has proven useful for attacking such diversified problems as measuring changes of attitude resulting from the presentation of a film, the precise quantification of differences in concept meanings between cultures, aesthetic judgment, and the description of sonar signals.

The first part of *The Measurement of Meaning* outlines the logic, development, and theoretical relationships of the semantic differential, largely in terms of a theory of learning developed by Osgood which has been expanded with particular reference to

human linguistic behavior. This half of the book also describes, for those interested, the basic extensive factor analytical work done to examine, refine, and develop the semantic differential itself. The second half of the book contains reports of research done by the authors, their students and colleagues, both in the business and academic worlds. Of particular interest are the studies in the realm of attitude change, the rating of colors and visual symbols, and the exercise of aesthetic judgment. Although not involving communications research, one very interesting study in the area of psychotherapy is noteworthy. This was a "blind" (using only the semantic differential) psychological analysis of the triple-personality case made famous in the book and motion picture, "The Three Faces of Eve."

The semantic differential is based on the premise that any concept (a painting, a person, a word, an abstraction such as "justice") may be defined or described linguistically, or metaphorically, in terms of adjectival opposites. For example, any concept can be rated (subjectively if not objectively) in terms of such pairs of adjectives as "warm-cool," "interesting-dull," and so on. Specific scales may be selected at will by the experimenter, without extensive preliminary work (such as is necessary for such tests as the Thurstone attitude scale) or use of prepublished forms. To make the test more sensitive, a seven-step scale is usually used for each pair of adjectives. In normal practice, a concept is rated on from 10 to 20 scales. A good many concepts may be rated by a subject in a single session, since an average person can make about 10 judgments a minute. In the semantic differential's most simple and common use, means are calculated for a group of subjects on each scale. This tabulating may be done by hand, or with calculating or punch-card machine assistance. Changes in meaning towards the concept on any scale can be easily determined by a retest using the same instrument, since it has been found that subjects cannot readily remember any of their ratings on the pretest. The stability of the test has been demonstrated in test-retest situations with no intervening message or major experience. A great deal of experimental evidence for the validity and reliability of this technique is presented in the book, particularly in Chapter 4.

A more refined method of analysis involves "factor scores." It is demonstrated that certain scales are highly correlated: for example, if a subject rates a concept as very "good," he is also likely to rate it very "valuable," "warm," and so on. The major

factor analyses conducted by the authors discovered that three major factors accounted for most of the variance when dealing with heterogeneous concepts. These factors, and scales most typical of them, are Evaluative ("good-bad"), Potency ("strong-weak"), and Activity ("fast-slow"). The Evaluative factor has been found to be very similar to various measures of "attitude" which have been developed. The use of these factors permits the choice of a smaller number of scales highly loaded on the factor, rather than a great number of presumably independent scales for each concept. Choosing scales on this basis is dangerous, however, when dealing with a homogeneous set of concepts. Using factor scores (the mean of the ratings on individual scales highly loaded on that factor) affords increased ease in interpreting results and certain economies in the mechanics of analysis. Of course, any collection of data such as is obtained from the semantic differential may be factor analyzed if one has the proper computing facilities, and factor loadings applicable to a given study obtained. Using the factor loadings obtained in the early work at Illinois should be attempted only after thorough reading of the applicable portions of the text.

This book, although not a "how-to-do-it," does describe the methodology of the semantic differential in sufficient detail to act as a handbook for the technique. Certain of the statistical methods commonly used to analyze results are described in the text and in an appendix. For those who wish to use this book as a guide for constructing their own versions of the test for their own purposes, it is unfortunate that there is no index. It would have also been desirable to include an appendix describing, in "cookbook" fashion, the simpler methods for analyzing data collected with the semantic differential, for those not knowledgeable in statistical methods. However, most of this information may be found in the pages of the text after a short search, and these omissions do not present any major difficulty. Anyone who wishes to conduct research into the subjective aspects of communication effectiveness, regardless of medium, would do well to examine this book and experiment for himself with the simple, yet effective, tool which it describes.

RESEARCH ABSTRACTS

FILM

PAGE, JAMES LEE. "The Production of a Community Development Film and Its Effect on Opinions of Local Viewers." Thesis and film available from the University of Wisconsin Library, Ph.D. Thesis Section, State Street, Madison 6, Wisconsin, 1959. 225 p.

Purpose: The purpose of this study was to Plan and produce the 16mm documentary film, *Racine Lakeshore Development*, and determine its influence on the opinions of local viewers.

Procedure: 396 adults from 11 community organizations and 92 social studies students assisted in the preparation of a film depicting the past, present, and possible future of the lakeshore. Questionnaires used before and after seeing the film asked about desirable and undesirable places in Racine. 15 community development factors were evaluated.

Results: Significant changes of opinion resulted from seeing the film. There were fewer indecisive responses. Emphasis on a particular project in the film tended to lessen the importance of other local projects. A larger percentage of females changed their opinion after viewing the film. Some subjects seemed to have a special interest for a specific age group. Older viewers seemed to be less susceptible to opinion change.—*L. Twyford*

TELEVISION

KRAUS, MAX H. "Television Systems for In-School Teaching." *Communications and Electronics*, September 1958. p. 406-11.

Purpose: To develop a practical television distribution system for the eight schools in the Hagerstown [Maryland] system.

Procedure: Distribution amplifiers were used to transmit three television signals within a school. Single channel and broad band amplifiers were used. Several methods were used for planning wiring to the classrooms. The location and size of receivers were dictated by conditions in the room and by student requirements. System costs were obtained.

Results: The broad band amplifier is best for small systems where individual channel control and high voltages are not required. Single channel amplifiers are more flexible and may give better results but are more complicated. Cables may be installed most conveniently in schools which have provided conduit for the purpose. However, cables can be easily installed in older buildings. The pattern for layout of cables is determined by the building configuration. Receivers are often placed along the long wall of a room to be closest to all students. 21-inch sets have been found to be satisfactory. Specifications were developed for the ideal educational set and stand to support it. $175 to $200 is the total cost for equipping a classroom.—*L. Twyford*

TRAINING AIDS

FROMER, ROBERT, and **HOROWITZ, MILTON W.** *Flight Information Displays for Instructional Consoles.* Technical Report NAVTRADEVCEN 20-05-31-1 by the Educational Research Corporation for the U.S. Naval Training Devices Center, Port Washington, L. I., New York. September 22, 1958. 83 p.

Purpose: To develop the best visual displays for the instructor who is teaching students in a flight trainer. Currently, the instructor has instruments which are duplicates of those in the cockpit. It is not known to what extent this information is utilized, nor is it known to what extent it may be more efficiently presented with a saving of time, money, effort, or error.

Procedure: Information was collected from two sources—literature and expert personnel. The former included literature on experimental tests of different modes of presenting information, literature on the Army-Navy instrumentation program, review of engineering publications to determine the major purpose of the instruments studied, and a review of military manuals. Expert personnel who were interviewed included engineers, pilots, and training device officers. These experts reported fully on their personal experiences, difficulties, and confusions in reading instruments. These two sources of information were integrated and used as a basis for recommendations.

Results: The most important factor in the design of an instrument concerns the type of information that the instrument is intended to present. For presenting quantitative information the counter is the best method if the rate of change of information is not too great. Otherwise, a pointer-counter is best. Qualitative information such as visual material should be displayed pictorially. Pressures, temperatures, and power should be given a spatial representation. An alignment principle should be used to display information that need only be checked. Three additional questions which were utilized in the design of instruments were: What specific information must be presented? Under what specific conditions will the information be used? What principles of design can be utilized to decide on the best mode of presentation? Each of 28 specific instruments most frequently found in instructors' stations was analyzed as to information presented, operating principle, major function, secondary function, type of information given, and a pictured proposal for future presentation.—*L. Twyford*

RESEARCH PAPERS

Presented at the 1959 National Convention of the Department of Audio-Visual Instruction

"Criteria for the Evaluation of Instructional Materials Centers"—John G. Church, Director, Instructional Materials Center, Eastern Washington College of Education

"Uses of a Communication Model in Audio-Visual"—George Gerbner, Assistant Professor, Institute of Communications Research, University of Illinois

"Classroom Screen Darkness Levels for Educational Film Projection"—Raymond E. Denno, Executive Vice-President, Sutherland Educational Films, Inc., Los Angeles, Calif.

"Report on Research on Post-Graduate Dental Instruction Utilizing a Six-State Closed-Circuit Setup"—Percy H. Tannenbaum, Director, Center for the Study of Mass Communication, University of Wisconsin

"The Learning and Voluntary Viewing Habits of a Military Population Exposed to Telecourses"—Joseph H. Kanner, Chief, Audio-Visual Applications Office, Army Pictorial Service Division, Department of the Army, Washington, D. C.; and Charles J. McIntyre, Chief, Instructional Procedures and Evaluation Branch, Office of Armed Forces Information and Education, Department of Defense, Washington, D. C.

"Report on the Wisconsin Physics Film Evaluation Project"—Walter A. Wittich, Professor of Education, University of Wisconsin; Milton O. Pella, Professor of Science Education, University of Wisconsin; Charles A. Wedemeyer, Director, Correspondence Study, University of Wisconsin; Lindley J. Stiles, Dean, School of Education, University of Wisconsin; and Frederick A. White, Director, Bureau of Audio-Visual Instruction, University of Wisconsin

"The Foundation, Organization and Development of the Catholic Audio-Visual Educators Association and a Suggested Administrative Pattern for the Organization of a Specialized Audio-Visual Association"—John H. O'Meara, Teaneck (N. J.) Public Schools

"Teaching Machines and Self-Instructional Materials: Recent Developments and Research Issues"—A. A. Lumsdaine, Program Director, Training and Education, American Institute for Research, Pittsburgh, Pa.

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